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July 1932

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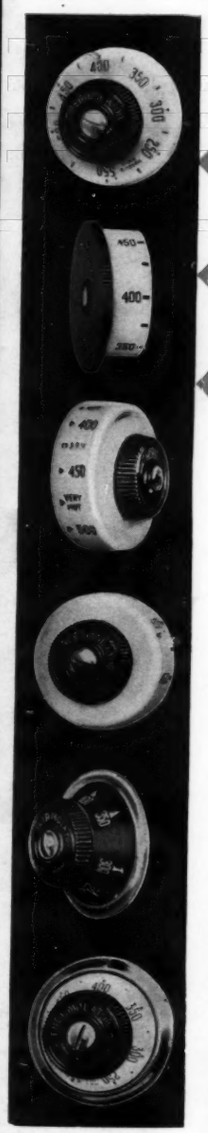

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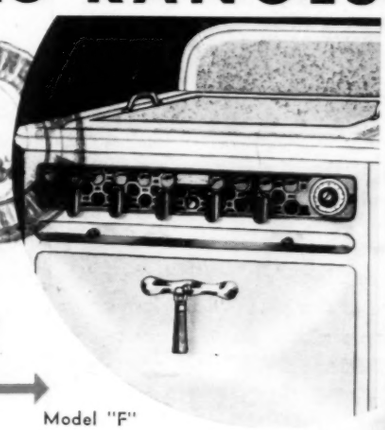

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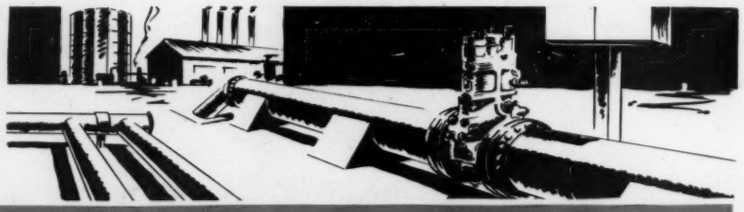

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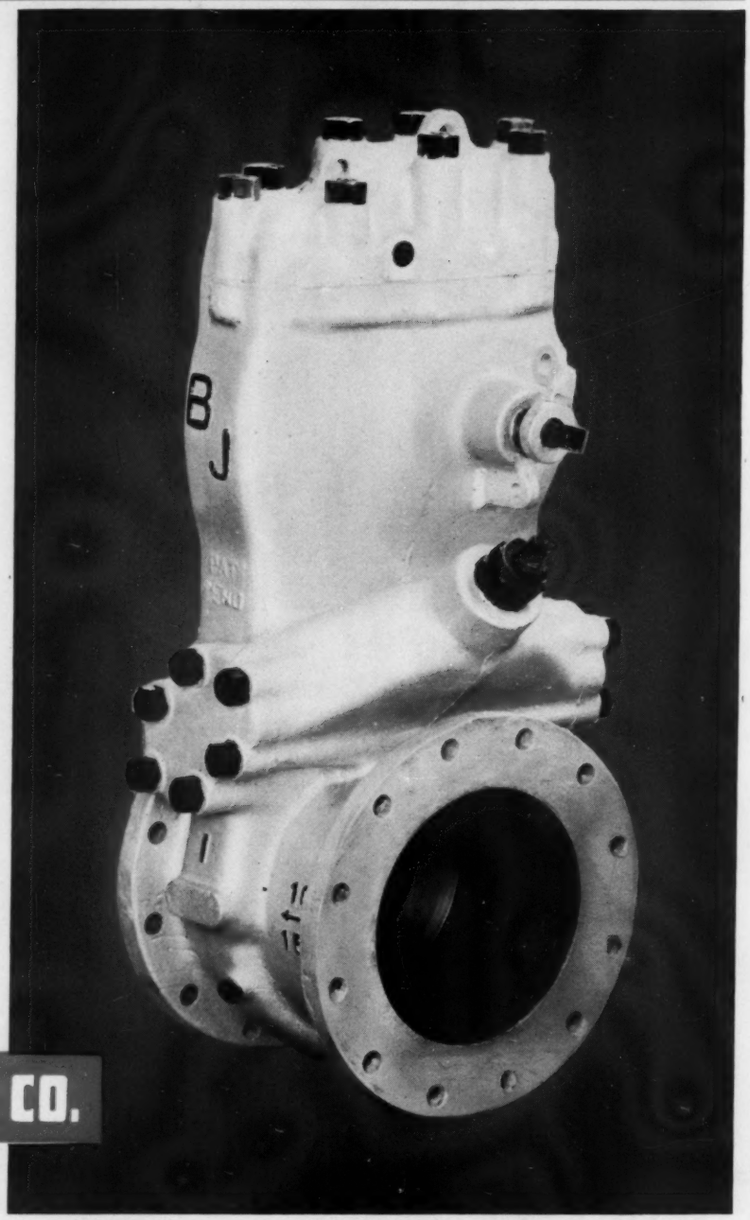

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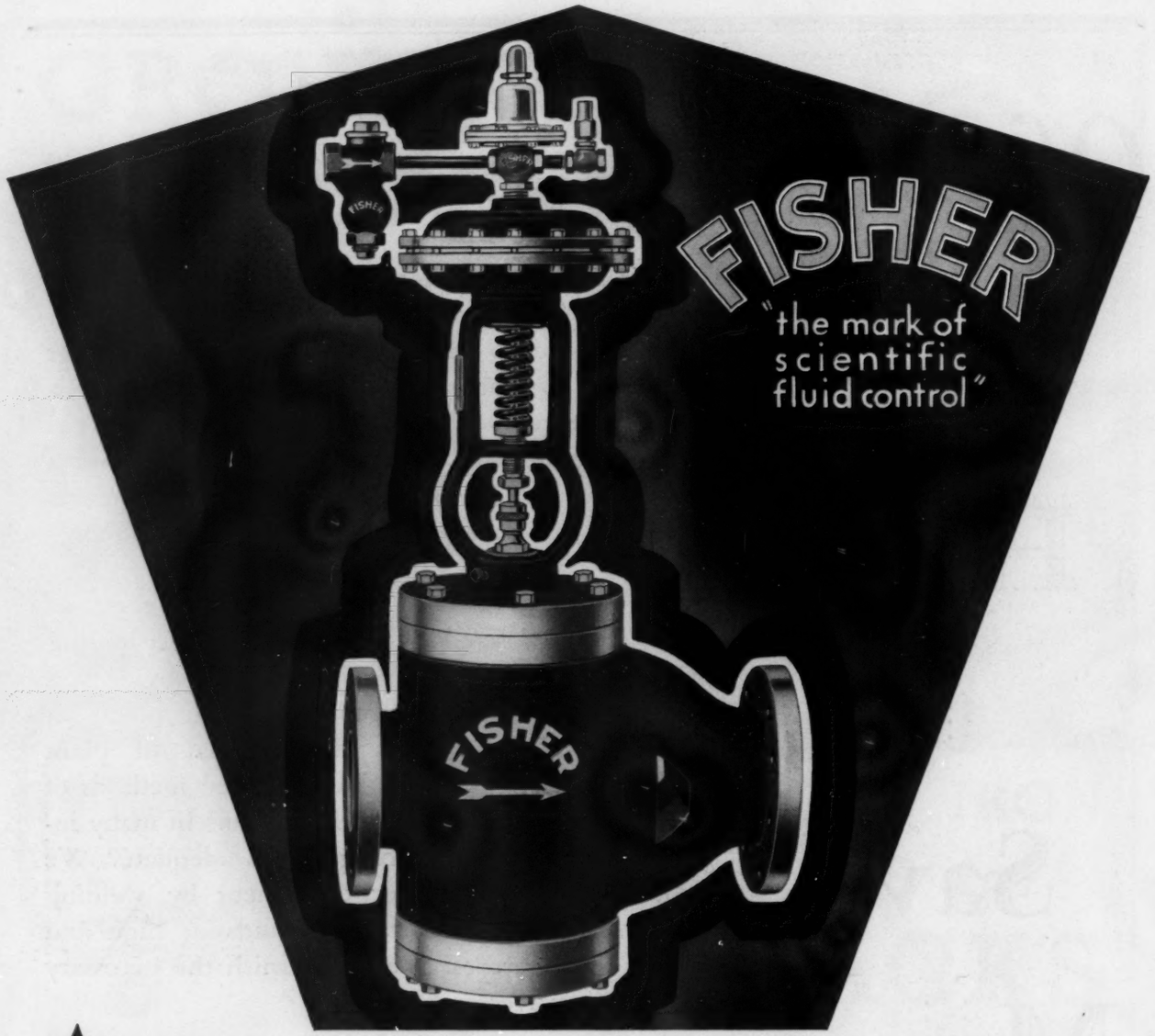

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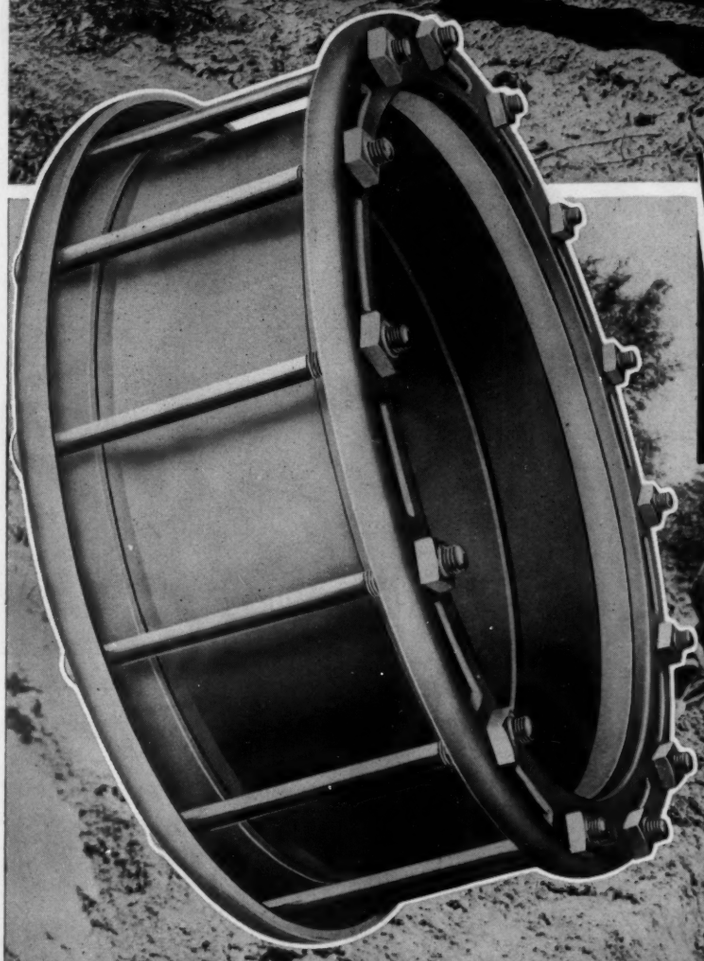

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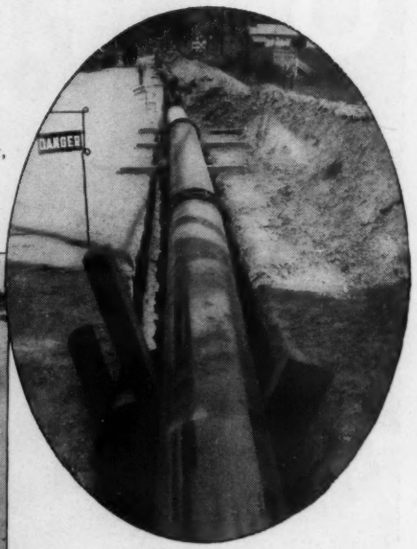

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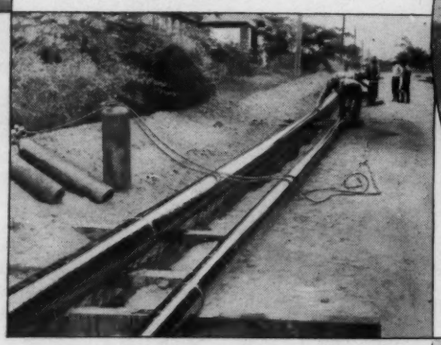

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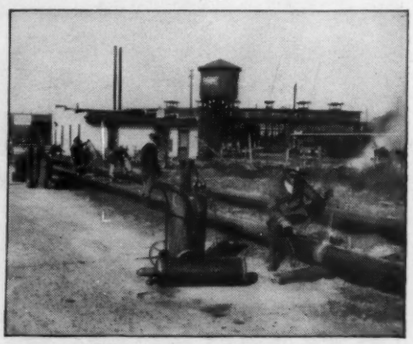

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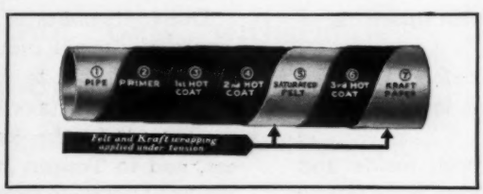

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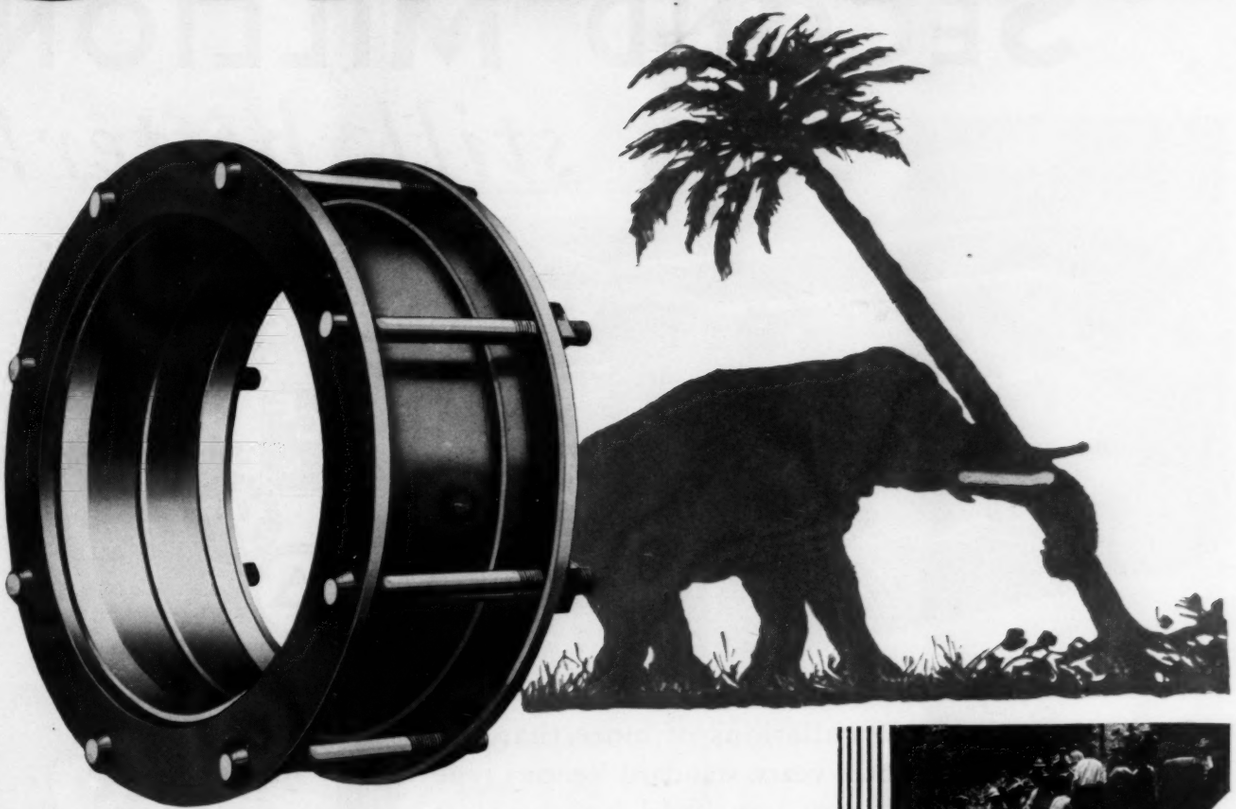

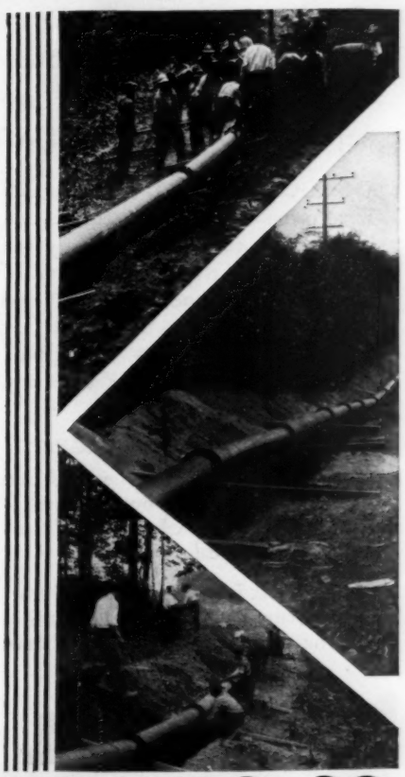

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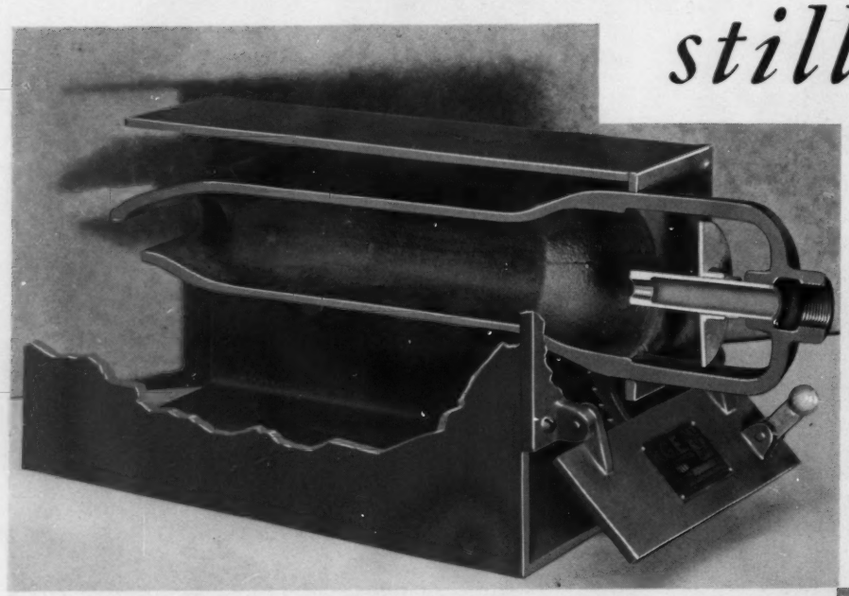

● SELECTED for installations of more than *one million horsepower* in three years, standard Venturi type N. G. E. burners are now improved by complete separation and control of primary and secondary air.

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Contents for July, 1932

Review of the Month 13

Protecting the San Diego Line 14
By Frederic A. Hough

A Finance Schedule for Installment Terms 16
By George H. Finley

Odorization Experience in Colorado 18
By Bruce MacCannon

Pintsch Gas Lights Now Burn "Natural" 22

Trends in Boiler Design 23
By William M. Jacobs

Developing Natural Gas Service for Small Towns 25
By W. O. Turner

PACIFIC COAST GAS ASSOCIATION 27

MEASUREMENT AND CONTROL 32
Ambient Temperatures and Gas Measurement . *By C. E. Pickup* 32
The Metric Wide-Range Orifice . . *By K. C. Tomlinson* 35

BUTANE-PROPANE NEWS 39
The Davis Reforming Process . . . *By W. A. Faber* 39

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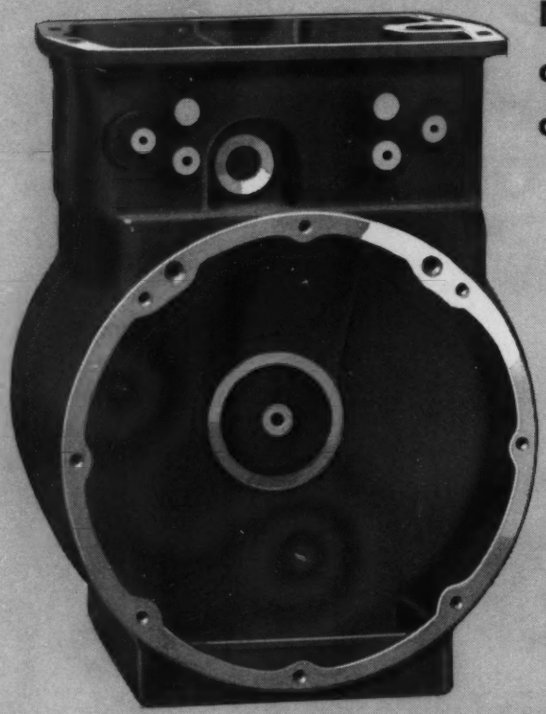

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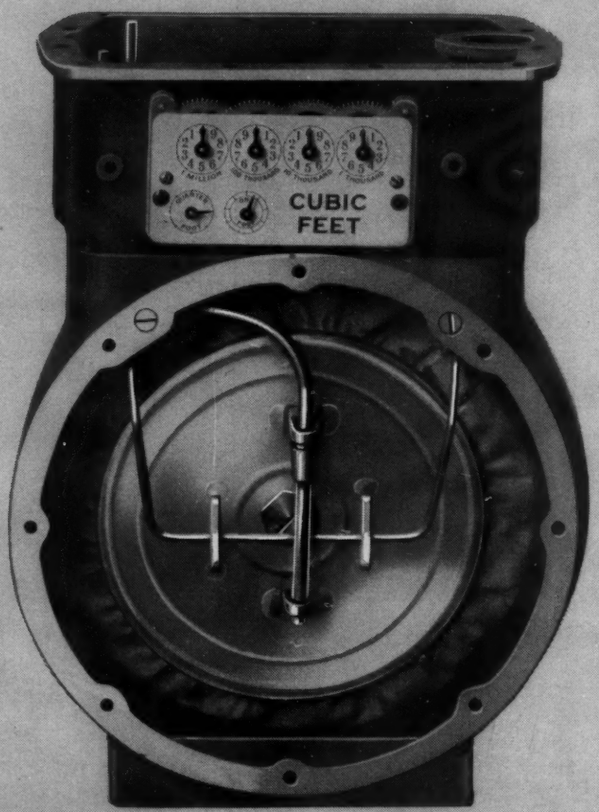

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July, 1932

WESTERN GAS

Vol. VIII, No. 7

"Reg. U. S. Pat. Off."

A Monthly Journal of the Gas and Gas Appliance Industries in *Western America*

Review of the Month

ANYONE needing a revival of confidence in the gas industry should read the news columns of this July edition with some care. There is much ground for encouragement in the numerous sales activities reported, and in the surprising amount of current construction.

Creditable Showing for Northwest Companies

A VISIT to a dozen or more gas properties throughout the Pacific Northwest, made during the past month by the writer, adds further conviction that gas service is meeting the test of present conditions with credit. Some of the most severe competition faced in the gas industry is encountered in the Northwest, from cheap electricity and wood. General economic conditions are no better there than elsewhere. Yet Northwest gas companies are putting their shoulders to the wheel and aggressively meeting their problems.

North of the international line the general tone is particularly one of optimism. The Vancouver company is carrying on a consistent sales program, making notable records for a manufactured gas utility in acquiring house heating customers; a new coal gas plant nearing completion will cut generating costs and make further rate reductions possible, to reach new industrial and heating consumers. There is no "depression" talk in Vancouver.

Seattle Gas Co. is making headway against a difficult situation, with municipal electric competition a constant battle. Gas sales for the first quarter of this year were 4 per cent ahead of last in Seattle. Here, too, progress is being made with house heating, the company's new "budget-plan" of spreading costs throughout the year proving an aid in selling and holding this load.

As is the case with all utilities, some meter loss attributable to unemployment is being experienced by many Northwest companies. In contrast, new customers are being added in some localities where strong selling effort is being made. A six-weeks campaign recently concluded by Northwest Cities Gas Co. on gas ranges not only exceeded sales expectations but added many new gas users.

Portland Gas and Coke Co., which has brought its by-product business to a high stage of refinement, is meeting much success with a new form of briquet, sales being 30 per cent above last year on this item.

All in all, Northwest companies are doing a fine piece of promotional work for gas, through emphasis upon customer service, sales, home service and kindred activities. They are proceeding in the knowledge that now is no time for relaxing on any effort essential to maintaining customers.

"Emergency" Buying Ties Industries' Hands

HAND-TO-MOUTH buying has been one common symptom of the unsettled attitude in all industries toward present and future business. Factory and retail stocks in all lines are down to the irreducible minimum. Even a field so stable as the gas industry is not exempt. A gas appliance factory sales executive recently brought this situation forcibly to the writer's attention, enumerating not one but many utilities whose warehouses to his knowledge were practically vacant. He testified further to delayed deliveries of materials required in his own factory, explained again by inadequate stocks carried by the fabricators. It is difficult to understand why this situation should exist in the gas industry. Established operating companies are in a strong earning position; appliances are still being sold; new natural gas territory is still being added; replacements and betterments in service facilities cannot be neglected.

Buying on an "emergency" basis will not enable gas industry manufacturers to continue their individual programs of development work—nor to carry through courageous national promotion programs such as that now being developed by gas range manufacturers. Filling out appliance and equipment stocks, at least to the point where routine demands may be handled in a normal way, is urgently needed. Under-purchasing by utilities has been severely felt in the manufacturing branch of the industry. Surely stable factors in the economic structure should lead the return to normal buying.

Common Purchaser Pipe Line Act Invalid

TEXAS legislators recently empowered the state railroad commission to regulate natural gas pipe lines and make them take gas ratably from all wells in fields touched by the lines. On June 8 this "common purchaser" act was held unconstitutional by a Federal district court. The court held that the act was confiscatory, that the legislature was without power to change the carriers' status from private to public; that the pipe line companies were operating in interstate commerce, the common purchaser act invading the field of Federal cognizance.

Soil Survey *and* Protection Southern Counties

By FREDERIC A. HOUGH

THE San Diego natural gas pipe line, with which this paper deals, is to be a 12-inch line, running from Huntington Beach to Rose Canyon in the City of San Diego, Calif., a distance of approximately 80 miles. The line is to be of welded steel construction and is designed for an operating pressure of 400 lbs. per square inch. It is to be located either on the coast highway or private rights-of-way paralleling the coast highway. Construction of the line is now under way. The route of the line runs through more thickly populated territory than is usually traversed by inter-city transmission lines. Because of this and rather severely corrosive soils encountered along the route, the protection of the line is a problem of importance. M. R. Thompson, vice-president in charge of construction for Southern Counties Gas Co., is in charge of the design and construction of this line.

F. A. Hough

Soil Survey

A soil survey was made with Shepard Earth Resistivity Meters (soil rods) to determine where and to what extent it will be necessary to protect the line. As a result of a similar soil survey now nearing completion, covering all territory supplied by the Southern Counties Gas Co., considerable data concerning the relation between the electrical resistivity of the soil and pipe-life are available.* The correlation found in this survey between soil-rod readings and pipe-life has been good enough to give us confidence in the soil-rods. We have, therefore, given considerable weight to the results of the soil survey for the San Diego line.

That survey consisted of making earth resistivity measurements at locations approximately 600 feet apart along the route of the line. At each location two readings were taken; one at 15-inch depth, and one at 30-inch depth. These readings and notes concerning the type of soil, drainage, etc., together with the location of the test, were recorded in a field book and later transferred to a map drawn to a scale of 400 feet to the inch. To make this survey two field crews consisting of two men each were used. On each crew was a man experienced in pipe line protection work and a helper. These crews worked under the supervision of A. B. Allyne.

It was decided at the outset that no coating would be used that is not designed to adequately withstand soil stress. Such coatings are expensive and their use cannot be justified in very mild soils. The chief purpose of the soil survey was then, to classify the soil along the route of the line into two classes, a corrosive class in which a protective coating should be used, and a mild class in which bare pipe should be used. The soil survey also served to locate hot spots where an extra-heavy protective coating should be used. However, the substantial properties of the coatings adopted for general use and their high cost has restricted the use of an extra-heavy coating to a few locations where the soil is extremely corrosive and the line is to be covered with heavy pavement.

After the results of the soil-survey had been plotted on maps, the route was divided into sections in which all resistivities were found to be 10,000 or more ohm-cms and into sections in which resistivities fell below this value. In those sections where the resistivities equaled or exceeded 10,000 ohm-cms, bare pipe will be installed. In all other sections protected pipe will be installed.

All information we now have concerning the relation between soil resistivity and pipe-life indicates that we might have been justified in using a soil resistivity somewhat lower than 10,000 ohm-cms as a division point between protected and unprotected areas. However, the high cost of reconditioning lines in territory such as this line is to traverse and the promise of complete protection offered by the methods we are to employ in the protected areas, have prompted us to be very conservative in the use of bare pipe.

The survey disclosed that there are 10 sections varying in length from 7,000 to 22,000 feet in which bare pipe can be installed in accordance with the policy just described. The total length of bare pipe to be installed is approximately 141,000 (24.8 miles), amounting to 31 per cent of the total length of the line.

In one instance the soil survey revealed that by changing the proposed route of the line from one side of the highway to the other for a distance 15,000 feet, very corrosive soil, necessitating heavy protection, could be avoided and the line could be laid in soil so mild that no protection is required.

Soil Variability

One important problem encountered in Southern California in soil survey work results from the variability of the soil. There are regions in Southern California where consistent resistivity readings can be obtained at a range of depths and at different locations, but in many cases resistivities ranging from 10,000 ohm-cms to 300 ohm-cms have been found along a vertical line running from the top to the bottom of a trench 36 inches deep. In some cases it is evident to the eye that the different soil readings are for strata of soils of distinctly different types. In other cases, the differences in the soils are not perceptibile to the eye.

After one has used the soil-rods for a time and has observed the extreme variability of soils in some locations, the anomalies that occur in the soil corrosion of pipe lines becomes understandable. The finding of a line badly corroded in one small area perhaps 2 feet long, and in perfect condition in adjacent regions is evidently caused, in some cases at least, by variations detectable by the soil-rods in the corrosive character of the soil. The deep pitting of the bottom of a 12-inch transmission line while the upper half remains in perfect condition was caused, in at least one case that has come to our attention, by a difference in the soils in which the two halves of the line are located. The lower half is located in soil having a resistivity of 1800 ohm-cms while the upper half is located in soil having a resistivity of 5000 ohm-cms. Strata 6 inches thick of inert soil such as sand are occasionally

* Soil Surveys by the Shepard Rod Method, A. B. Allyne. *Western Gas*, Vol. VII, No. 8, August, 1931, pp. 127-129.

Measures *for* San Diego Line

Distribution Engineer
Southern Counties Gas Company
Los Angeles, Calif.

PLANS for the natural gas line now under construction to San Diego, Calif., call for the most complete job of line protection which has yet been undertaken. Mr. Hough's description of the thorough soil studies conducted, and particularly of the electrical protection which is being specified for the first time on the San Diego line, will interest every transmission engineer. The paper published in these pages was given at the June 14 conference on soil corrosion, held in Los Angeles at the call of the Pacific Coast Gas Association's Technical Section. The conference is reviewed elsewhere in this issue.—EDITOR.

found immediately above strata of very corrosive alkali soils. Such strata may be found in one area at varying distances from the surface.

If in the course of a soil survey a region is found in which the resistivity measurements vary a great deal from point to point, the only safe thing to do is to protect the pipe against the worst soil conditions.

In areas where the soil survey indicates that bare pipe can be installed we believe that it is not safe to install such pipe without first checking in the open trench the resistivity of the soil.

It is impossible at the time the original survey is made, to know at all points at just what depth the pipe is to be laid. Because of this fact and the variability of the soil, it is probable that small hot spots would be missed by a survey in which tests are taken at a constant depth at intervals of, say 600 feet.

The taking of resistivity readings at 50-feet intervals back of the trenching machine is an inexpensive operation. The application of short lengths of coating in the field at points where these readings indicate the need for a coating is entirely feasible. This practice is being followed in the bare pipe sections.

Protective Means to Be Employed

Two bituminous coatings are to be used, one a field applied coating consisting of:

a. Coal-tar primer.
b. Coal-tar enamel (200° M.P.)
c. Coal-tar enamel (200° M.P.)
d. Asbestos felt wrapper (applied after the enamel has cooled and therefore unbonded);

and the other, a yard applied coating consisting of

a. Asphalt primer
b. Hot coat of blended asphalt
c. Rag felt wrapper
d. Hot coat of blended asphalt
e. Rang felt wrapper
g. Kraft paper

Approximately two-thirds of the coated portion of the line will be protected with the coal-tar coating and one-third with the asphalt coating.

In the few places where extremely corrosive soils are encountered and the line is to be under pavement, a coal-tar coating will be used consisting of the coal-tar coating previously described (except that the wrapper will be bonded), to which another coat of enamel and another wrapper of asbestos felt will be added.

To supplement the protection afforded by these protective coatings, electrical drainage, or, as it is sometimes called, cathodic protection, will be employed. By draining current from the pipe and returning it to the soil through a suitably designed electrode the potential of the protected portions of the line will be kept below that of the soil. Thus, every pin hole, bruised spot or holiday in the protective coatings will be made cathodic and corrosion at these exposed points will be prevented. Details concerning this phase of our protection program are given in the last section of this report.

At several points the line is to be located in the bottom of salt-water lagoons. In these places 5/8-inch wall galvanized steel pipe is to be used. The very heavy wall provides weight to prevent the line from floating and also insures a long life even if the galvanizing fails to protect. A very heavy coat of galvanizing is to be used. Our previous experience with galvanized lines in the Los Angeles Harbor has been quite satisfactory. The use of galvanized pipe rather than coated pipe permits welding sections on the banks of the lagoons and dragging them into position. Welds in these galvanized sections are to be sprayed with molten zinc.

Pipe suspended on bridges will be of standard weight and will be galvanized.

Before a final decision was made concerning the means for protecting the line, several other plans were considered. Enameled pipe recently placed on the market by one pipe manufacturer was investigated. It was finally decided not to use this pipe because at the time the decision had to be made there was some doubt in our minds concerning the corrosion resisting properties of the enamel coating, and the cost of that coating exceeded the cost of the protective means finally selected. It seems to us that the protective materials and methods selected offer such promise of complete and permanent protection that any additional cost involved in using any other protection plan is not justified. However, the enameled pipe looks very promising.

Our investigations made subsequent to the time that our decision concerning the San Diego line was made have convinced us that the corrosion resisting properties of the enameled pipe are excellent and that it is worthy of careful consideration, especially if the cost of the coating can be lowered.

We also consider the use of a cement coating applied over a bituminous material and finally rejected this coating because of its cost.

The use of cold paints was not considered for this line because our previous experience with such coatings, and the American Petroleum Institute and the American Gas Association tests indicate that such coatings have little or no protective value. Grease coatings were not considered because our experience with these coatings indicates to us that their effective life in our dry Southern California soils is too short to justify their use.

The elimination of all these materials left for our consideration coatings of the hot bituminous type. The selection of the materials and the design of the coatings finally adopted were influenced very largely by our analysis of the results

(Continued on Page 42)

PACIFIC GAS AND ELECTRIC COMPANY TIME PAYMENT PLAN
Schedule of Monthly Installments and Unpaid Amount of Contract

(1) Unpaid Cash Balance	(2) 12 MONTHLY Installments		(3) 18 MONTHLY Installments		(4) 24 MONTHLY Installments		(5) 30 MONTHLY Installments		(6) 36 MONTHLY Installments	
	Amount of Contract	Amt. per Month	Amount of Contract	Amt. per Month	Amount of Contract	Amt. per Month	Amount of Contract	Amt. per Month	Amount of Contract	Amt. per Month
12.00	12.96	1.08								
13.00	14.04	1.17								
14.00	15.12	1.26								
15.00	16.20	1.35								
16.00	17.28	1.44								
17.00	18.36	1.53	19.08	1.06						
18.00	19.44	1.62	20.16	1.12						
19.00	20.52	1.71	21.24	1.18						
20.00	21.60	1.80	22.32	1.24						
21.00	22.68	1.89	23.58	1.31	24.24	1.01				
22.00	23.76	1.98	24.66	1.37	25.44	1.06				
23.00	24.84	2.07	25.74	1.43	26.64	1.11				
24.00	25.92	2.16	26.82	1.49	27.84	1.16				
25.00	27.00	2.25	28.08	1.56	29.04	1.21				
26.00	28.08	2.34	29.16	1.62	30.24	1.26	31.20	1.04		
27.00	29.16	2.43	30.24	1.68	31.20	1.30	32.40	1.08		
28.00	30.24	2.52	31.32	1.74	32.40	1.35	33.60	1.12		
29.00	31.32	2.61	32.40	1.80	33.60	1.40	34.80	1.16		
30.00	32.40	2.70	33.66	1.87	34.80	1.45	36.00	1.20	37.08	1.03
31.00	33.48	2.79	34.74	1.93	36.00	1.50	37.20	1.24	38.52	1.07
32.00	34.56	2.88	35.82	1.99	37.20	1.55	38.40	1.28	39.60	1.10
33.00	35.64	2.97	36.90	2.05	38.16	1.59	39.60	1.32	41.04	1.14
34.00	36.72	3.06	38.16	2.12	39.36	1.64	40.80	1.36	42.12	1.17
35.00	37.80	3.15	39.24	2.18	40.56	1.69	42.00	1.40	43.56	1.21
36.00	38.88	3.24	40.32	2.24	41.76	1.74	43.20	1.44	44.64	1.24
37.00	39.96	3.33	41.40	2.30	42.96	1.79	44.40	1.48	45.72	1.27
38.00	41.04	3.42	42.48	2.36	44.16	1.84	45.60	1.52	47.16	1.31
39.00	42.12	3.51	43.74	2.43	45.12	1.88	46.80	1.56	48.24	1.34
40.00	43.20	3.60	44.82	2.49	46.32	1.93	48.00	1.60	49.68	1.38
41.00	44.28	3.69	45.90	2.55	47.52	1.98	49.20	1.64	50.76	1.41
42.00	45.36	3.78	46.98	2.61	48.72	2.03	50.40	1.68	52.20	1.45
43.00	46.44	3.87	48.24	2.68	49.92	2.08	51.60	1.72	53.28	1.48
44.00	47.52	3.96	49.32	2.74	51.12	2.13	52.80	1.76	54.72	1.52
45.00	48.60	4.05	50.40	2.80	52.08	2.17	54.00	1.80	55.80	1.55
46.00	49.68	4.14	51.48	2.86	53.28	2.22	55.20	1.84	56.88	1.58
47.00	50.76	4.23	52.56	2.92	54.48	2.27	56.40	1.88	58.32	1.62
48.00	51.84	4.32	53.82	2.99	55.68	2.32	57.60	1.92	59.40	1.65
49.00	52.92	4.41	54.90	3.05	56.88	2.37	58.80	1.96	60.84	1.69
50.00	54.00	4.50	55.98	3.11	58.08	2.42	60.00	2.00	61.92	1.72
51.00	55.08	4.59	57.06	3.17	59.04	2.46	61.20	2.04	63.36	1.76
52.00	56.16	4.68	58.32	3.24	60.24	2.51	62.40	2.08	64.44	1.79
53.00	57.24	4.77	59.40	3.30	61.44	2.56	63.60	2.12	65.88	1.83
54.00	58.32	4.86	60.48	3.36	62.64	2.61	64.80	2.16	66.96	1.86
55.00	59.40	4.95	61.56	3.42	63.84	2.66	66.00	2.20	68.04	1.89
56.00	60.48	5.04	62.64	3.48	65.04	2.71	67.20	2.24	69.48	1.93
57.00	61.56	5.13	63.90	3.55	66.00	2.75	68.40	2.28	70.56	1.96
58.00	62.64	5.22	64.98	3.61	67.20	2.80	69.60	2.32	72.00	2.00
59.00	63.72	5.31	66.06	3.67	68.40	2.85	70.80	2.36	73.08	2.03
60.00	64.80	5.40	67.14	3.73	69.60	2.90	72.00	2.40	74.52	2.07
61.00	65.88	5.49	68.40	3.80	70.80	2.95	73.20	2.44	75.60	2.10
62.00	66.96	5.58	69.48	3.86	72.00	3.00	74.40	2.48	77.04	2.14
63.00	68.04	5.67	70.56	3.92	72.96	3.04	75.60	2.52	78.12	2.17
64.00	69.12	5.76	71.64	3.98	74.16	3.09	76.80	2.56	79.20	2.20
65.00	70.20	5.85	72.72	4.04	75.36	3.14	78.00	2.60	80.64	2.24
66.00	71.28	5.94	73.98	4.11	76.56	3.19	79.20	2.64	81.72	2.27
67.00	72.36	6.03	75.06	4.17	77.76	3.24	80.40	2.68	83.16	2.31
68.00	73.44	6.12	76.14	4.23	78.96	3.29	81.60	2.72	84.24	2.34
69.00	74.52	6.21	77.22	4.29	79.92	3.33	82.80	2.76	85.68	2.38
70.00	75.60	6.30	78.48	4.36	81.12	3.38	84.00	2.80	86.76	2.41
71.00	76.68	6.39	79.56	4.42	82.32	3.43	85.20	2.84	88.20	2.45
72.00	77.76	6.48	80.64	4.48	83.52	3.48	86.40	2.88	89.28	2.48
73.00	78.84	6.57	81.72	4.54	84.72	3.53	87.60	2.92	90.36	2.51
74.00	79.92	6.66	82.80	4.60	85.92	3.58	88.80	2.96	91.80	2.55
75.00	81.00	6.75	84.06	4.67	86.88	3.62	90.00	3.00	92.88	2.58
76.00	82.08	6.84	85.14	4.73	88.08	3.67	91.20	3.04	94.32	2.62
77.00	83.16	6.93	86.22	4.79	89.28	3.72	92.40	3.08	95.40	2.65
78.00	84.24	7.02	87.30	4.85	90.48	3.77	93.60	3.12	96.84	2.69
79.00	85.32	7.11	88.56	4.92	91.68	3.82	94.80	3.16	97.92	2.72
80.00	86.40	7.20	89.64	4.98	92.88	3.87	96.00	3.20	99.36	2.76
81.00	87.48	7.29	90.72	5.04	93.84	3.91	97.20	3.24	100.44	2.79
82.00	88.56	7.38	91.80	5.10	95.04	3.96	98.40	3.28	101.52	2.82
83.00	89.64	7.47	92.88	5.16	96.24	4.01	99.60	3.32	102.96	2.86

AT THE LEFT is the opening page of the Pacific Gas and Electric Co.'s schedule of term payment charges. Interest is at 8 per cent per annum. P. G. and E. carries no dealer paper, but dealers can offer similar terms through independent financing. This uniform plan was used by the company during a spring water heater campaign with terms running as long as 30 months.

Adequate *for*

By GEORGE H. FINLEY
Managing Editor
Western Gas

LIBERAL terms are essential to any successful sales program on gas appliances. In the light of present merchandising trends this statement should be agreed in by most gas appliance merchandisers, dealers and utilities alike. The next question, to which a satisfactory answer must be found in every sales area, is—"How liberal?"

A comprehensive study of this problem was recently made by the Pacific Gas and Electric Co., as a result of which a detailed schedule governing time payments and carrying charges has been issued for use on its term contracts for both appliance purchases and installation work. The background of this plan, as related to the writer by F. U. Naylor, manager of gas sales for the P. G. and E., is of general interest to other sales departments which are thinking in this direction.

To begin with, several factors pointed urgently to the need for liberal terms in the company's sales program. Competition alone demanded them, as illustrated by this case from a competitive industry: A 100-day sale of electric refrigerators in northern California last summer disposed of more than 10,000 refrigerators, two-thirds of them on a 3-year pay plan. Terms no less favorable, it would seem, are essential on major gas appliances where such competition exists—and it exists generally, for the whole list of major household appliances as well as other commodities.

It was further accepted as basic to the sales problem that monthly payments must be kept lower to suit the present average buyer's abilities, than was the case a few years ago. A $10 monthly payment may not sell a mass market today; whereas installments of $5 will tap a more general buying level. And it is the general buying level which must be reached to add volume gas load, particularly on a system only recently changed over to natural gas service, as was the case with the P. G. and E.

Investigation into the credit experience of finance companies and leading merchandising organizations further convinced the company that on small payments the per cent of delinquency runs comparatively low, and that it reaches dangerously high proportions where monthly payments are larger.

For a number of years the Pacific Gas and Electric Co. has maintained exceptionally close touch with dealers in its service area, developing cooperative sales methods to a high point. Through its many dealer contacts the company has noted a general change in financing policy, dealers abandoning the fixed discount for cash (usually 10 per cent) and going to a basic cash price plus a carrying charge proportionate to the number of months in the term contract. It was found upon study into dealer policy that both those who handled their own term paper and those who discounted their contracts through finance companies were adding carrying charges dependent upon length of the terms. This change in dealer practice of course is in line with improved merchandising, and every establshed dealer has available financing services which make it possible for him to do business on such a basis.

From its study into dealer practice, and a detailed analysis of merchandising policies in other lines, the gas company reached the definite conclusion that its own sales should be so programmed as to make it possible to offer liberal terms, especially in campaign periods, and to make a finance charge for such terms which would be *no less* than that charged by dealers for equivalent length contracts. Furthermore it was decided that the amount of the down payment or the length of the terms, that is, whether they shall be 12, 18, 24 or even 30, or 36 months should be no more liberal on sales made by the utility than those made by legitimate dealers. For example, if 10 per cent and 24 months to pay are the best terms that the dealers can extend subject to proper

Financing Schedule *Is* Basis Liberal Installment Terms

finance charges the gas company likewise adopts these as its selling terms.

Former cooperative sales work with dealers had of course observed this general policy, but the purpose sought in establishing a complete financing schedule was to liberalize terms within limits available equally to dealers, and in line with present needs of the purchaser. Two cooperative campaigns, one of which was carried through before adoption of the new schedule, and one following it, will illustrate. In the summer of 1931 house heating jobs were sold with a summer discount, October 1 dating, and terms up to 18 months. Finance charges for terms of this type used by the gas company were no less than those used by dealers. On January 1 of this year the company's new schedule went into operation, and under it a cooperative water heater campaign was conducted this spring. One of the selling features was a monthly payment as low as $3.40 which required 24 to 30 month term contracts. Similar finance charges were used by both gas company and dealers. This campaign exemplifies the liberalizing of terms on a basis advantageous to both company and dealer.

A summer house heating drive will be carried through with the same favorable type of term offer.

In laying out its detailed scheme of finance charges the P. G. and E. consulted a number of national finance organizations, and was guided by their scale of charges. Endorsement of the schedule was secured by the whole gas appliance industry of its section—dealers, distributors and manufacturers. Upon adoption of the schedule copies were distributed among manufacturers and manufacturers' representatives, to be relayed by them to their respective dealers.

It is interesting to note that before adoption of its present finance schedule the company was frequently approached with requests to finance dealer paper on appliance contracts. The company does not take dealer paper, and no longer is asked to, for any established dealer can arrange to offer the same terms used by the company.

With this article is reproduced one page from the P. G. and E.'s price book, in which the complete schedule of term charges is printed. Unpaid cash balances ranging from $12 to $515 are provided for, length of contracts running from 12 to 36 months. The first page of the schedule has been selected for publication in this connection, because it illustrates how small balances have been eliminated. Neither dealer nor company wants to add to its accounting detail unnecessarily; under the P. G. and E. schedule, therefore the minimum monthly payment that will be accepted on any term payment sale is $1.00 per month regardless of whether the contract is for a 12-months' period or longer.

The finance charge is figured at a straight 8 per cent per annum.

Use of the finance schedule is further described in the following quotations from the P. G. and E. price book:

"To obtain unpaid cash balance, deduct from the total cash price of merchandise and/or installation, original credits such as down payment and/or trade in allowance. If this deduction leaves an unpaid cash balance of an uneven amount (such as $153.25), use as the unpaid cash balance the next lower figure in Column 1 if the odd cents are under 50 cents or the next higher figure in Column 1 if the odd cents are over 50 cents.

(Continued on Page 37)

Below is seen one of the bill-board showings which will accompany a "united industry" campaign on gas house heating in Northern California this summer. Long terms will be offered by both dealers and gas company, the P. G. and E.'s carrying charges on term contracts being based on its new schedule.

Odorization Experience *in*

By BRUCE MACCANNON

WHEN natural gas was introduced in the gas properties of the Public Service Co. of Colorado, one of the first major differences noted by the company employees, particularly the men assigned to complaint work, was the lack of a distinctive odor. This characteristic did not appear at first as a problem of great importance, but it was soon noted that the number of leak complaints rapidly decreased. It was evident our customers were accustomed to detect gas leaks by the odor of the manufactured gas.

This decrease is graphically represented on the curve in Fig. 1. This is a plot of the gas leak complaints in Denver per month per meter in service, based upon the average of the preceding 12 months, and covers a period from September 1, 1927 to March 1, 1932. Prior to August, 1928, the Denver system was on manufactured gas. The immediate effect of the natural gas introduction can be noted, and the decline is due to two primary causes. Before the introduction of natural gas in Denver, a thorough inspection was made of all appliances and services, which had a tendency to forestall many complaints that in time would have been brought to our attention; and the second cause, as mentioned above, that the odor of the gas gradually decreased, although the natural gas continued to absorb light oils and naphthalenes in the mains for some time. The odor thus obtained rapidly decreased as the more available deposits were picked up.

We anticipated that the natural gas would dry out union gaskets, grease on service cocks, meter diaphragms, and cast iron pipe joints, which would increase our normal hazards of operation. This was met by an intensive water and oil saturation program. Prompt action along this line saved us many leaks and considerable trouble, but there was always the probability that our leaks were increasing in number and size even though the complaints did not show this increase.

The advisability of an odorant in the gas was unquestioned. We had at this juncture two possible methods that could be used. The first was to introduce into a given district a powerful odorant for a given period of time, with a specially organized crew following up the leak complaints, and moving into a new district when major repairs had been accomplished. This method was not considered the remedy for the Denver situation. We desired a permanent odorization that would give us continually effective results. The second, and the one adopted, was to odorize continuously the gas coming into the city distribution lines. The drawback of this method was that it probably would not give us much assistance in locating street leaks, but we considered the detection of leaks inside of buildings the principal requisite of an odorant. We were aware that only very bad leaks were discovered by the odor when manufactured gas was in use, and we did not expect any more from a practical odorant than that.

Bruce MacCannon

Perhaps the best available list of desirable characteristics of an odorant is the one prepared by a committee of the Pacific Coast Gas Association. The following characteristics are listed in their report:*

1. Harmless, neither toxic nor nauseating.
2. Penetrating odor, similar to the manufactured gas odor.
3. Burn completely, without harmful or odorous combustion products.
4. Non-corrosive.
5. Odor must remain in the gas, not affected by injection of oil or water into the gas.
6. Insoluble in water.
7. Chemically inert.
8. Cheap and available.

We felt that our odorant must conform in general to all these points.

To determine the feasibility of a product for our requirements, it was decided to build an experimental injection plant. The section selected was supplied by an underground regulator station. The territory supplied was completely isolated from the rest of the Denver residential district. A simple injector, consisting of a sight feed and a needle valve, was installed with an overhead run tank on a temporary scaffold. The amount of odorant injected was slowly increased from 1 gallon to 2½ gallons per million cubic feet passed by the station. Within a short time, the troublemen (who did not know of the injection experiment) reported an odor in the gas. However, we noted no increase in complaints from this area. This lack of leak detection was disappointing, but after considering the

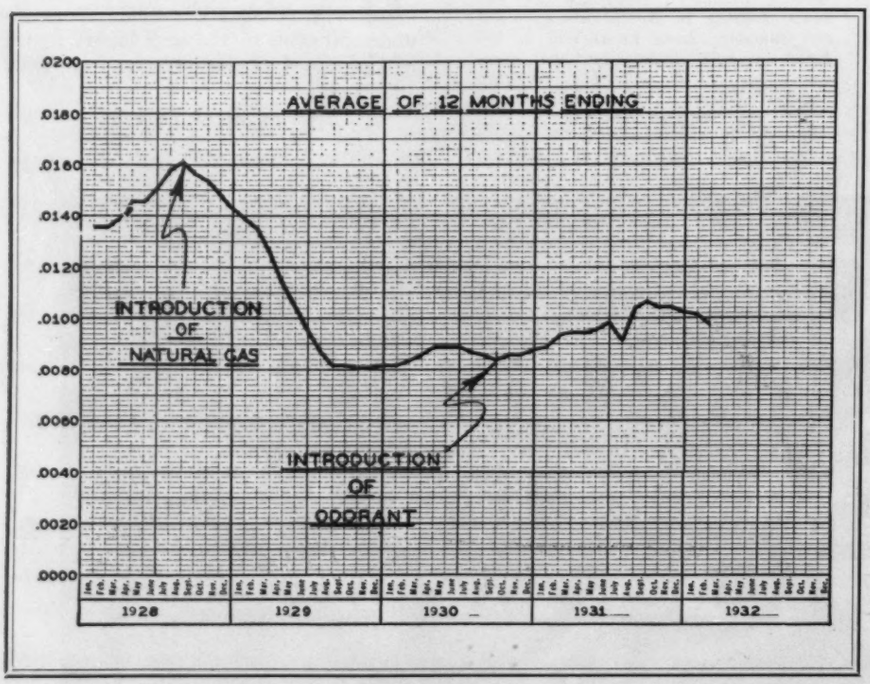


Fig. 1. Number of executed gas leak complaints per month per meter, Public Service Service Co. of Colorado, Denver.

*Western Gas, September, 1930, Page 111.

Colorado

Gas Measurement Department
Public Service Company of Colorado
Denver, Colorado

area selected and noting that this territory was one of the newest in the city, it was felt that the test was not conclusive.

Shortly after this a similar experiment was conducted in another section of the city, using the same type of equipment. This test was conducted, however, from a station that had an operator, and an attempt was made to regulate the flow with the load. As before, the troublemen were not informed that we were odorizing the gas, but they soon reported the odor of the fitting shop. The injection rate varied from 1 gallon to 3 gallons per million cubic feet. During the month this test was run, there were 184 more complaints recorded than in the corresponding month of the previous year. Tests were also run at this time in a room in order to observe the concentrations of gas that were noticeable. The odor was used at the rate of 2½ gallons per million cubic feet, and a burner flowing 12 cubic feet an hour was allowed to flow unlighted into the room. The room measured 10 x 10 x 8 feet. Several observers entered the room when the concentration of the gas was one-fourth of one per cent, or possibly less due to seepage at the door and windows, and every one pronounced the odor very noticeable.

These same men left the room for 15 minutes, and upon their return still found traces of the odor. With an explosive limit of 4.8 per cent for our natural gas, a mixture well below the danger point should be noticed by the average person.

There are several ways to economically inject odorants into the gas. We believe it is feasible to inject at the source of supply for a town, thus eliminating the necessity of several odorization plants. The most practical apparatus for use at any given location depends considerably upon local needs, local load factors, attention available, type of distribution system, etc. To meet local requirements, we have installed injection apparatus in intermediate pressure lines serving several regulator stations, and in low pressure systems where one regulator suffices for a town. These towns have also included the so-called low pressure distribution where the pressure in the mains does not exceed 10 inches of water, and in the variable pressure systems with smaller-sized main, where the pressure may reach 100 inches of water.

The ideal odorization is given when the apparatus is adaptable to varying

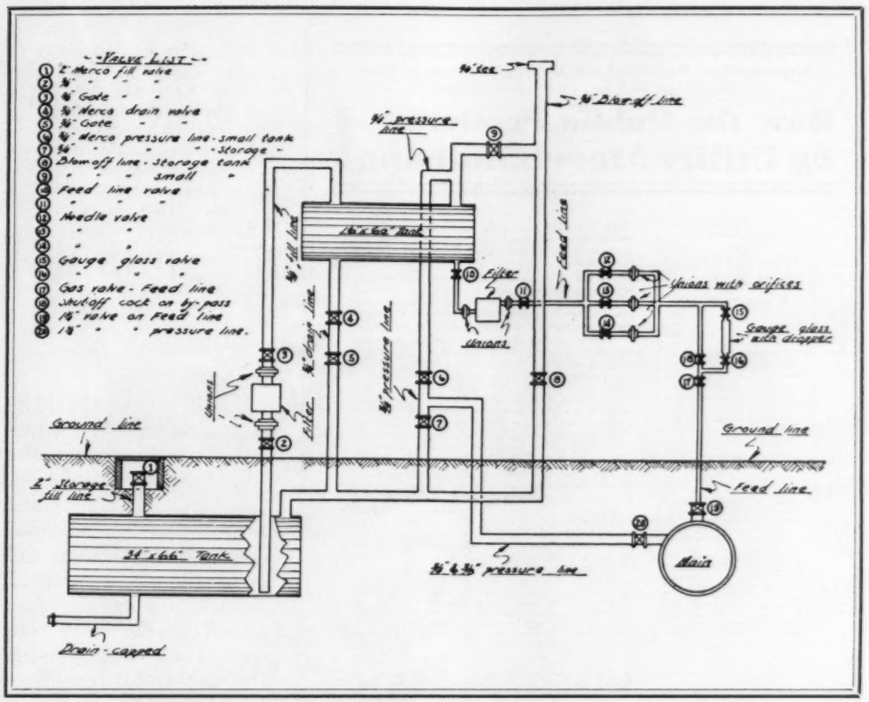


Fig. 2. Showing diagram of odorant equipment, Public Service Co. of Colorado.

the amount of odorant directly with the flow of gas, and also allowing control of the volume injected per million cubic feet. The simplest form of injector consists of a run tank and needle valve for control. Many refinements may be added until this simple arrangement becomes fully automatic, varying the amount of oil injected directly with the gas delivery.

Odorizing Apparatus

The Public Service Co. of Colorado has installed several simple units which consist of a storage tank, holding at least a month's supply of the odorant; a run tank, holding at least two days' supply; an injector, consisting of several orifices in parallel; and a sight feed. A diagrammatical sketch of this apparatus in shown in Fig. 2.

No attempt has been made to vary the amount of odorant by hours, but the daily deliveries are watched closely and the correct amount injected for a 24-hour period. With this system the peak hours do not receive their proportionate amount of odorant, while the minimum hours receive more than their share. This method undoubtedly has drawbacks, but it has, nevertheless, a decided advantage. The odorant used during the peak hours is not of as much value in emphasizing leaks as the odorant used when the consumption is low. This may seem to be a paradox. However, the rapid consumption of gas during peak hours changes the gas in a given distribution system in a short time. During minimum hours the flow is very slow. The amount of odorant is over-emphasized at times of low consumption, and it has been our experience that the majority of leaks are discovered during this period.

Among other types of installations, there is the wick odorizer type, which is used chiefly for small plants. This odorizer consists of a wick, one end of which is in the gas stream, and the other end in a supply of the odorant. The evaporation of the odorant is proportional to the gas flow. The most popular type of odorizer in use today for larger stations is the apparatus designed to follow the gas load. These injectors are in wide usage.

At Denver the type of installation in general follows the diagram shown in Fig. 2, but in place of the fixed orifices an automatic valve was installed to control the flow of the odorant. This valve is actuated by a differential obtained from Pitot tubes placed in the main line. One of these tubes faces up stream and the other down stream to obtain the maximum differential. A third tube facing down stream is used to inject the oil. The results obtained in Denver are gratifying, although as shown in Fig. 1, the odorization has not caused a great increase in leak complaints. However, the figures show a slight but steady increase. We have maintained satisfactory odorization during this year by using 3 gallons of odorant per million cubic feet during the summer, and less than 2 gallons per million cubic feet during the winter. We have also noticed that the odorant has shown no tendency to drop out under river crossings or in any of

(Continued on Page 48)

Experience Shows That Dealers Make More Appliance Sales by Active Co-operation with the Utilities' Merchandising

How the Public Profits *by* Utility Merchandising!

How Utilities Benefit Your Community

The Public Utility Companies in your town help keep quality of all appliances standardized.

They make fair prices on such items.

They maintain a staff of expert service men for your convenience day or night.

They provide employment and payrolls.

They pay rents.

They pay taxes which keep dollars in action in your town.

They co-operate in every civic enterprise.

They make it possible for your community to enjoy the best in modern conveniences.

Speaking publicly recently of the effect of the "Merchandising Law" in Kansas, John Redmond, editor of the Burlington Republican said: *"I am firmly convinced that the law is a bad thing for Kansas, and that any law similar to it would be bad in any state . . . it is wrong in principle and serves no useful purpose."*

THE unceasing efforts of the utilities have resulted in steadily decreasing rates for their products. Today the products of the Utilities stand among the cheapest commodities.

The gas and electric industries have achieved this result by exerting every effort to build up the volume of gas and electricity sold. As the unit consumption has gone up, rates have come down—resulting in a saving to the American people of hundreds of millions of dollars.

Sales of gas and electricity can only be increased through sales of new modern appliances. That is why we sell merchandise. We want the housewife, the farmer, the merchant to have tested, dependable gas and electric conveniences, so that lowest possible rates can be provided. Utility properties are dedicated to the service of the public—safely, economically, adequately. Without merchandising, this aim cannot be achieved—that has been proved by conclusive trial. Cooperation of the utilities with dealers has proved ultimately satisfactory—fights spell loss and disaster to everyone involved.

The unfavorable results of such anti-merchandising laws as have hastily been enacted in Oklahoma and Kansas are now generally known. Repeal is being urged in both states. A proposal for a similar law was defeated in Massachusetts in March, 1932. Mississippi likewise voted against such legislation in March, 1932—after thorough study of its effect in destroying the liberties and privileges of the public.

It is our sincere conviction that the active participation of the utilities in merchandising is necessary for the building up of our load so that the public will receive the full benefits of gas and electric convenience at reduced cost. It is important to the public interests that you actively oppose any attempt to remove the utilities from the merchandising field. We are anxious to receive any suggestions for means of improving service to our customers.

Look for the next of this series stating FACTS in regard to UTILITY MERCHANDISING in this paper soon.

MISSOURI ASS'N. of PUBLIC UTILITIES

Here is the fourth message on utility merchandising, broadcast as display advertising in Missouri newspapers by the Missouri Association of Public Utilities.

More Sales Facts *for* Missouri Public

THROUGH the Missouri Association of Public Utilities, gas and electric companies of Missouri are continuing their informational campaign, telling the people of their state of the need for their merchandising work. Above is a small-size reproduction of the fourth advertisement in the series of messages now appearing over the utility association's signature in daily and weekly newspapers throughout Missouri.

With Kansas and Oklahoma close at hand to provide object lessons of the ills which follow from prohibiting utility sale of appliances, there is an abundance of facts upon which the Missouri campaign is making a strong appeal.

As a part of the Missouri association's informational work on the merchandising situation, publicity is being given to the numerous editorial statements in Kansas and Oklahoma newspapers, which during the past few months have observed the damage done by the prohibitory laws in these states and now are actively seeking repeal of the legislation.

Sentiment in Missouri, judging from press opinion, is rapidly mounting against any introduction of legislation similar to that in Kansas and Oklahoma. The Republican Editorial Association and the Ozark Press Association have formally declared against such legislation. During its June convention the Southeast Missouri Press Association called upon a representative of the Kansas press for a review of the law's effects in Kansas. E. B. Chapman of the Topeka State Journal presented a paper in which he pointed to unemployment, lack of appliance servicing, inadequate appliance sales work now being conducted, vacant stores formerly used in utility sales activities, loss of business to merchants whose appliance trade had formerly been stimulated by utility advertising, loss of advertising revenues to publishers, and other effects of the restrictive law which have been noted in the Kansas experience.

A Gas Range "Exhibit de Luxe"

IN all of the major offices of the Southern Counties Gas Co. throughout Southern California is being shown a special display which features four gas ranges, including two custom-built models and a large size and smaller range of more moderate price.

The purpose of this special display is two-fold: To impress upon the general public that everything which could possibly be desired in a range is available in a *gas* range—the custom-built models serving exactly as in the automotive field, to raise the standard of desire and develop appreciation for the convenience features and advanced construction details offered in better ranges. The second purpose to be served by the display is, to strengthen the confidence of gas company salesmen and employees generally in the gas range for every home, whether small and modest, or large and luxurious.

A portable background in multiple panels was built for the Southern Counties display with a solid black velvet velour finished at the top by a broad gold leaf stripe. Large cut-out letters at the top of the background spell the word "MODERN", and underneath are the lines "Natural Gas Ranges—$53.50 to $2180.00."

In advance of the arrival of the display in any community the local office mails from 1,000 to 2,000 special invitations, on heavy note paper in square envelopes ordinarily used for social announcements, to potential range buyers. In addition, local managers and salesmen mail from 40 to 100 personal invitations each. Dominant display advertising and publicity support the display during its showing. Usually a local woman's club holds a tea or other function at the company office during the "exhibit de luxe", and in several towns the high school classes have arranged a field trip to view the display. Light refreshments are served each afternoon from 2 to 4 o'clock and open house is held in the evenings from 7 until 9. Attendance has ranged from 400 to 2,000 in the showings held thus far, and the exhibit has been exceedingly helpful in centering interest upon gas ranges in Southern Counties territory.

Taxi Service *for* Sales Prospects

J. FREMONT, new business manager for the British Columbia Electric Power and Gas Co., Ltd., tells *Western Gas* of something different in the way of making sales appointments. Salesmen for the company's lines of appliances have the privilege of calling a taxicab to bring Vancouver housewives into the company's salesrooms for appliance demonstrations. About two months ago each salesman was supplied with a credit card on a local taxicab company, and allowed to use his own discretion as to when its use is justified. For sev-

eral of the salesmen who do not maintain their own cars the taxi service is essential, but other salesmen also find that it is often impressive with the prospect, particularly in making telephone appointments, to be able to offer to "send a cab." Naturally, taxicab service is reserved for those who are felt to be definitely in the market for a particular appliance. B. C. Electric salesmen work on the closed territory system, have been in their territories for several years each, and as a consequence know their sales possibilities thoroughly.

A "Burner Tip" Rate *for* Heating

A PLAN for adding house heating load in some 40 towns of Kansas is being put to work by the Kansas Power and Light Co., Salina, as described in the following statement from F. P. Dicus, superintendent of distribution for the company:

"The Kansas Power and Light Co. recently inaugurated a plan whereby furnace conversion equipment will be furnished by the company as a part of its gas service. For this class of service a special "Burner Tip" rate was filed with the Public Service Commission. This rate is identical with the company's standard domestic rate for the first 3,000 cubic feet of gas used per month and for all over 3,000 cubic feet an additional charge of 10 cents per thousand is added to the standard rate. The new rate will be in effect for the months of October, November, December, January, February, March, April and May. For the remaining four months the customer will automatically revert to the standard rate.

"In consideration of this additional charge the company will install an automatically controlled furnace burner and maintain it as long as the customer desires this class of service. This will include a service line from main to furnace where one does not already exist. The company owns the equipment. The estimated revenue for the use of the equipment is $13.60 per year per burner.

"When a burner is installed a deposit of $20 is made by the customer, deposit to be refunded when $50 worth of gas has been used and paid for. The deposit is collected as an evidence of good faith on the part of the customer. This service is purely optional and does not affect the standard domestic rate in any manner.

"This plan is more or less an experimental one and is intended to add heating load principally in rental properties. A campaign was started two weeks ago and three solicitors have secured 50 contracts.

"Under this plan the company expects to add 1,000 heating customers within the next six months."

In view of the statute prohibiting sale of appliances in Kansas by utilities it is interesting, to say the least, to note the method which Kansas Power and Light is using to add essential load to its lines.

Kindling *for* Gas Heating Prospects

Montana Power's book match "ad copy."

MINNESOTA Northern Power Co., Minneapolis, Minn., has found a use for the new type of "pull-out" book matches as an interest builder for gas house heating. The illustration above, reproducing the Montana-Dakota Power Co. (Minnesota Northern Subsidiary) book match advertising in actual size, tells the whole story. A. E. Schwarz, commercial manager for the company, writes *Western Gas* that this small selling tool is designed chiefly to put across one idea—"That you light the furnace—then forget it."

Portland Gasco Closing Dealer Sales

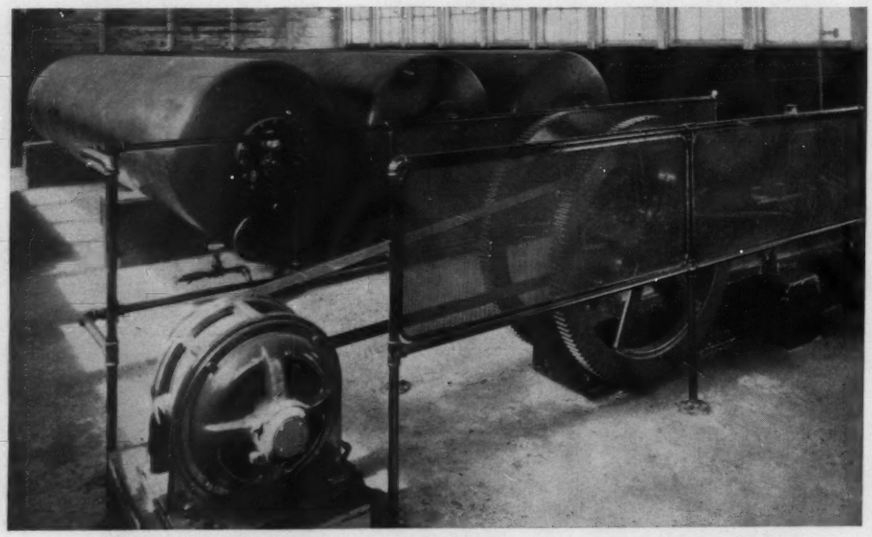
AN interesting example of gas company-dealer cooperation has been developed by the new business department of Portland Gas and Coke Co. During past months gas company salesmen in Portland, as in most other centers, have found some difficulty in holding up the sales curve. Among the reasons submitted for harder selling was the explanation that customers found more attractive trade-ins, lower down payments, and longer terms available from Portland dealers than from the gas company.

An opportunity to further stimulate dealer sales, and at the same time improve sales morale in the company force, was seen in this situation by John H. Hartog, sales manager for the Portland Gas and Coke. Gasco salesmen were told to take prospects who were interested in terms or merchandise not available through the gas company, directly to the dealer and close the sale on the dealer's floor.

Sales commissions are based largely upon estimated annual revenue, for the Portland company's salesmen, and it was decided to offer the same commission to the salesmen when closing sales for a dealer as for the company. This system was followed for six months, from November of last year. Then a meeting was held with Portland dealers, who were enthusiastic over the evidence of gas company sales assistance. At this time the dealers were asked to relieve the gas company of a portion of the commission expense on sales closed for them by gas company salesmen, and a 10 per cent commission was agreed upon to be paid by the dealers. Upwards of a score of merchants are following this plan, and new interest in gas range sales possibilities is apparent.

A marked increase in the number of dealer displays and amount of dealer advertising of gas appliances has been evident since this plan was inaugurated. During National Gas Range Week,

May 9-16, the gas company bore half the cost of dealer advertising, with the privilege of determining when dealer advertisements should be published. Increase in dealer sales over last year under the present program has been considerable—in March, 5.3 per cent; April, 30 per cent; May, 26 per cent.



Compressor room in Southern Pacific yard, showing tanks for high pressure storage of natural gas. Individual small tanks installed beneath passenger coaches are filled from this storage.

Pintsch Gas Lights Burn "Natural"

WHILE the average traveler by railway may not appreciate the difference, it is a fact that natural gas now is being used in a large number of passenger coaches for lighting. Up to the past few months these coaches were lighted by Pintsch Gas, manufactured by the Southern Pacific Co. in Oakland, Calif.

The Southern Pacific Co's Pintsch gas plant had been in operation since 1894 manufacturing an oil gas used to illuminate the passenger coaches. The gas after manufacture was compressed and then introduced into the steel tanks carried on the coaches. From the pressure tank the gas is released through a regulator which reduces the pressure to 2 pounds, at which pressure it is delivered to the various illuminating fixtures throughout the car. Pintsch gas is high in illuminants, which produce a light of relatively high luminosity.

In the early part of 1931 as a result of an interview by a Pacific Gas and Electric Co. industrial gas salesman the Southern Pacific Co. conceived the idea of reducing its coach lighting costs by substituting natural gas for Pintsch gas. The principal question involved was whether natural gas would give sufficient illumination through the equipment used for Pintsch Gas; if it could be used, natural gas was considerably cheaper.

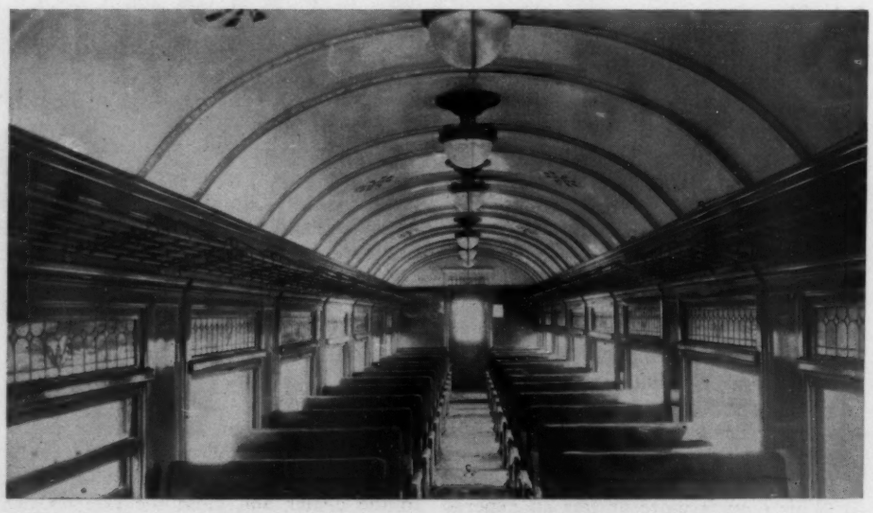
In order to answer the question the Southern Pacific Co. side-tracked a passenger coach at the Pacific Gas and Electric Co. laboratory in Emeryville. Natural gas was put through the Pintsch Gas mantles and tests were made with a foot-candle meter to determine its illuminating power. The same meter was used to judge the illuminating power of the Pintsch gas. The result was that natural gas gave about 10 per cent less illumination, although the difference was barely discernible to the human eye. It was possible to create equal illumination with natural gas by increasing its pressure, but this would have necessitated changing the regulators which reduce the pressure between the gas tanks and the mantles.

The Pintsch gas had been sent by the railroad in tank cars from their manufacturing plant to various distribution centers. The gas had been pumped from the cars into stationary storage tanks where it was held under a pressure of about 180 pounds. The first natural gas used by the Southern Pacific Co. was introduced directly into the storage tanks of the San Francisco distribution center from the Pacific Gas and Electric Co.'s high pressure mains, and the same compressors are now operated to increase the pressure of the natural gas from 35 pounds to about 180 pounds. About 3,000 cubic feet per hour at atmospheric pressure is compressed.

In 1930 the Southern Pacific Co. manufactured an average of about 1,280,000 cubic feet of Pintsch Gas per month. Since natural gas contains about 17 per cent more heat units per cu. ft. the equivalent consumption in natural gas should be about 1,060,000 cu. ft. per month.

The San Francisco compressor station already is using about 130,000 cubic feet of natural gas per month, and a high pressure line is rapidly being completed to serve the Oakland distribution station.

Although the Southern Pacific Co. is electrifying its coaches as fast as appropriations will permit, the above use of natural gas is an economical expedient and is indicative of the enterprise of the Pacific Gas and Electric Co's industrial gas salesmen.



Interior of smoking car with natural gas illumination.

Trends *in* Boiler Design

By WILLIAM M. JACOBS

Assistant Industrial Engineer, Southern California Gas Company
San Bernardino, Calif.

DEVELOPMENTS in boiler technology which have led to the present types of boiler design are traced by the author of this discussion. Characteristics of each type are dealt with, offering practical assistance to those dealing with boiler conversion problems. From earlier and present boiler types Mr. Jacobs passes on to consider the gas-fired boiler of the future, with the trend toward higher pressures, small size and low cost per developed horsepower. His discussion was given before the Pacific Coast Gas Association's 1932 Mid-Winter Conference at Los Angeles, Calif.—EDITOR.

A STUDY of the trend of boiler design is both interesting and encouraging, for it reveals the probability of a stable and increasing demand for fuel gas in years to come. The number of British thermal units equivalent to the amount of fuel consumed each year in this country is approximately 25x1015, and of this more than half is used as boiler fuel. In 1930 something like 10 per cent of the boiler fuel consumed was natural gas, and its use is increasing very rapidly. Boilers of every type and size, from the small house-heating unit to the large central station steam generator, are now economically eligible for conversion to gas fuel. But of even greater importance is the boiler of the future, which quite possibly will be designed to burn gas exclusively.

The first boilers, known to have existed prior to 150 B. C., were virtually tea kettles; and those of Newcomen and Watt in the eighteenth century were little more. They were very rudimentary vessels, and were seldom operated at pressures much greater than atmospheric. At this time, however, increasing interest in steam power was manifest, with the result that boilers developed steadily into different types.

These early English boilers were of the internal-furnace type; hence it was natural that practice in that country developed along that line. The principal outgrowth was the Scotch marine boiler, which attained great popularity because it lent itself well to marine use. Being self-contained, its internal furnace, general compact shape, and light weight, met the requirements of ocean-going vessels. These same characteristics have caused this boiler to be quite popular in certain small stationary installations.

Likewise, the invention of the locomotive demanded the same light weight and self-contained furnace characteristics of a boiler; but the large cylindrical boiler was not of the right shape. The result of these requirements was the development of the multi-tubular locomotive boiler, which stands as the highest type of fire tube boiler today. Installations utilizing this boiler in one or more of its several forms are to be found in many small stationary power plants.

In America the horizontal return-tubular type of fire tube boiler attained great favor and became a standard, a generation ago. This boiler was well adapted to duplication, and could be satisfactorily fired with a wide variety of fuels. The limited capacity of these boilers necessitated the use of many units in large power plants, and as many as 50 to 75 boilers, brick set in long rows in batteries of from two to six, were housed in a single, low, dark, boiler room. Hand firing resulted in piles of coal and ashes in front of the boilers, and the entire boiler house was dingy and dirty. Such conditions were incentives to the development of the water tube boiler; the boiler of today. The return-tubular boiler, however, is still standard in small installations, and will probably never become extinct.

Fire tube boilers as a class had many limitations. They could not economically be built for high pressures because the large diameter of their shells necessitated the use of boiler plates excessively heavy; furthermore, a tube or flue will not withstand as much pressure when it is applied externally as when applied internally. They were also relatively unsafe: with large, thin shells containing large volumes of water under pressure they represented a hazard; for when they failed, destruction was rife. It has been estimated that there is sufficient energy stored in a 60 horse-power return tubular boiler under 75 pounds pressure to project it in case of rupture to a height of more than a mile. And failure in this type of boiler usually took form in a shell rupture. Furthermore the fire tube boiler is not adapted to units of large size—a serious handicap.

Water Tube Boiler: These limitations, in the face of clamoring demands for more and more power, forced the development of the water tube boiler. The inherent design of this class of boiler, utilizing one or more drums of relatively small diameter and tubes with the pressure internally applied, was easily adapted to use with higher pressures. All pressure parts could be of cylindrical or spherical form, thus eliminating in most types the use of any flat or stayed surfaces under pressure. By virtue of these features, plus the fact that the energy content per unit of boiler weight was usually much less than in the former class, the safety of the water tube boiler was much greater. By having the water content of the boiler contained in many small tubes or drums instead of in one large shell, a boiler failure would probably take the form of an isolated tube leak, thus practically nullifying the hazard. As a consequence of these facts, water tube boilers were built in larger and larger sizes, and as their characteristics became known several types were developed. The first was the "horizontal" type, utilizing a bank of straight tubes slightly inclined to the horizontal, located under a longitudinal drum and connected to headers, front and rear. Different manufacturers used different arrangements of headers or tubes, but the pattern was essentially the same. When this type of boiler was operated at high loads, the circulation and passage of steam was impeded at the headers, and the water circulation often split or reversed itself, resulting in overheating the tubes. A geyser action over the front header usually accounted for the wet steam obtained. The tubes, being straight and rigidly fixed at both ends, were distorted when overheated, causing excessive strains on the boiler and often damaging and baffling. In order to replace a bad tube, it was often necessary to cut away several good ones. And cleaning such a boiler meant the opening of the header hand-holes at each tube end, and the handling and assembling of many hundreds of parts.

Designers soon began to realize the importance of good circulation within

the boiler. Not only was rapid circulation necessary to maintain all boiler parts at a uniform temperature, thus preventing expansion strains and overheating, but by wiping away steam bubbles and pockets adhering to the tube walls good circulation actually increased the rate of heat transfer from furnace to water. Hence the next important type of water tube boiler to make its appearance was the "semi-vertical," or multi-drum curved tube type. This boiler appears today in many patterns, but all have the same general characteristics. Circulation is definitely a ring flow: water descending in the rear passes and steam and water ascending in the front. Very little hindrance to this circulation is offered in the boiler design; the tubes discharge the steam directly into the several drums and the inclination of the front tubes is sufficiently great to maintain rapid one-way motion on the inside. The tubes in this type of boiler are curved so as to enter the drums radially; these bends offer the means to absorb the expansion and contraction, and any tube may be replaced without disturbing any other.

Because there was no apparent limit to the rate of heat transfer through scale-free boiler surface as long as internal circulation kept the inside of such surface constantly wet, the tendency grew to operate boilers at constantly increasing overloads. This netted a material reduction in boiler size and capital outlay for any given steam requirement. It became evident, however, that the furnace was the limiting factor in the progress toward higher capacities. The burning of more and more fuel under a boiler required more and more furnace volume, until furnaces became as large as practical. Increasing the heat liberation per cubic foot of furnace volume meant higher temperatures, and while this was advantageous, beyond a certain point it was destructive to furnace refractories. It therefore became necessary to cool the furnace walls with water-cooled tubes, which were made integral with the boiler.

The Modern Boiler: This brings us to the modern steam generator, with water-cooled furnace, economizer, air pre-heater, superheater, and controls so automatic that the boiler operator is practically an overseer, whose duty is simply to see that each piece of apparatus functions in its intended manner. Such units are built in very large sizes; one recent installation in a central station guaranteed one and one-quarter million pounds of steam per hour from a single unit. In heat units of output, this is approximately equivalent to 36,-200 boiler horse power! And in practice the capacity far exceeds the guarantee. It is interesting to note that it is impractical to rate such boilers containing water walls, economizers, etc., in terms of horse power, because the manufacturer's rating of a so-called boiler horse power is simply 10 square feet of heating surface. Obviously, water walls or economizers are not correlated to boiler surface as far as rates of heat transfer are concerned.

Two types are prevalent in large modern water tube boilers: the semi-vertical type with several drums, and the sectional header or horizontal type with one cross drum. Refinements of design in the latter have greatly improved the circulation over that found in earlier boilers of this type. For very high pressures, a drum must be forged from a single steel billet and machined; hence economics often dictates the use of the horizontal boiler with the single cross drum.

It might be said that the present trends in design are toward higher efficiencies, higher steam pressures and temperatures, and a greater use of radiant heat. The overall efficiency of a good water tube boiler will range from 75 to 82 per cent; if water walls, economizers, superheaters or air preheaters are used the efficiency may approach 90 per cent; and this can be increased if it becomes economically expedient to put more heating surface in the path of the flue gases.

The prevailing pressure range is 400 to 460 pounds per square inch; however, higher pressures are being used. Several boilers are now in regular service operating at 1300 to 1400 pounds, and in 1931 an industrial unit went into operation at 1800 pounds. Steam temperatures range from 750°F. to 850°F. As the metallurgy of boiler parts advances, these temperatures will increase.

The advance in use of radiant heat in the large steam generators is particularly significant. Regardless of whether the discovery of its value was accidental or premeditated, the fact remains that it is due to its use that the present high boiler efficiencies and capacities are economically possible. Tests on completely water-cooled furnaces are showing that more than half of the total heat units liberated in the furnace and introduced in the preheated air are absorbed as radiant heat by the water-cooled furnace envelope. So far as is known at present, furnace radiation approximately follows the Stefan-Boltzmann law and increases as the fourth power of the absolute temperature. Completely cooling the furnace with water tubes permits heat liberation in excess of 40,000 B.t.u. per cubic foot of furnace volume per hour, with its attendant high temperature and high radiation. Thus the furnace-cooling tubes become of major importance in the proportion of heat absorbed. In fact, the trend in steam generator designs is toward purely radiant-heat boilers with convection zones given to superheaters, reheaters, economizers, and air heaters. This trend is hinted by two installations of high pressure single-pass boilers in this country and one abroad. These boilers are of the cross drum type with one set of headers vertical and the other inclined so as to present a diminishing area to the passage of flue gases. Test reports on these installations will probably be forthcoming soon which will indicate a high portion of radiant transfer in the furnace surface.

Present Boiler Problems: Before passing from the boilers of today, I would like to touch on the manner in which certain characteristic features of the various types may influence the combustion of fuel and the conversion to gas. It must be noted, however, that no general rules are applicable to the methods of firing all boilers of the same type, because certain variations in design, dimension, or setting may dictate firing conditions.

The Scotch marine type presents the most difficulties to good combustion with gas because of its furnace, which is of small diameter and relatively cold. Not only does the limited furnace volume make complete combustion difficult with high heat liberations, but the small cross-sectional area of the furnace so increases the velocity of the burning gases that the cold flues are reached often before the gases are completely burned. The boiler water surrounding the furnace keeps it relatively cold, and it is necessary to line the furnace with refractories as far back as combustion takes place. A dutch-oven or external furnace extension will serve to increase the furnace volume and available length of flame travel, and permit high furnace temperatures for at least a short zone.

Locomotive types are limited in furnace volume and hence capacity, and also have cold furnaces. The best results are obtained by locating the burner in the rear of the furnace and firing forward, in order to utilize the greatest available path of combustion. Burners used should be of such types that offer quick combustion and short flames.

The return-tubular boiler presents few firing difficulties, but it is worthy of note that quick combustion is necessary to obtain high heat release, and hence radiant transfer through the shell, without carbon monoxide losses. Preheated air may sometimes be obtained by drawing it under the furnace floor from the rear, but this should not be attempted unless the available stack draft is sufficient.

Water tube boilers of the horizontal type may present diversified problems.

(Continued on Page 43)

Developing Natural Gas Service *for* Small Towns

By W. O. TURNER

Chief Engineer
*Louisiana Power & Light Company**
New Orleans, La.

THE service of natural gas in many small towns has been made possible by the extension of gas transmission lines for industrial loads and for general supply to the larger towns and cities. In the classification of towns as to whether large or small, we might think of the small towns as having populations ranging up to 5,000 but more generally with populations of from 500 to 3,000. Towns of this size, scattered as they actually are in the South, could not for their supply alone justify very long transmission lines so it is considered in this discussion that gas is available at the town border and that the transmission line is justified by the rate paid for the gas by the distributing company to the pipe line company. Any available industrial business is considered only as being contributory to the existence of a supply at the town border. With this assumption the problem is to develop within the town the economic justification for a distribution system. The sequence of development of gas service in a small town is no different from what it would be in a large town or in a city for that matter, except that we might say it is on a miniature scale. The sequence for development quite naturally will be:

1. study of the territory.
2. Layout and construction.
3. Introduction of product.
4. Operation.
5. Future.

Each phase in this sequence will be generally discussed with a few specific applications added to bring out certain points.

Study of the Territory

A commercial study of the territory is quite naturally the first point of development. This study will reveal the number of possible customers, by classes and by comparison with other territories the estimated consumption and revenues. The rate applied will of course assume whatever form is in use by the distributing company so designed as to yield a return on the investment. The revenue per average customer with fixed rates will vary in accordance with climatic conditions. As climatic conditions somewhat establish the necessity for use of a commodity such as gas as fuel for heating, the rate of development or rate of addition of available customers will also vary in different climates. The rate of customer development also varies with the nature and habits of the people being served, so it is very easy to over- or under-estimate the rate of development of present available business. Table No. 1 shows for four groups of small towns the wide variations in first year business that may be expected.

Group A, B, and C are located in territories having the same climatic conditions and where the people have much the same habits. Group "D" is located in a slightly warmer climate and the inhabitants also differ from those of the first three groups. Practically the same effort was put forth and the same methods used to obtain customers in all the groups. It might be well to add that in the study of these territories the same rate of customer addition was considered for all; however, it would seem that there will be a considerable difference in the actual rate. It would be to advantage to consider initially such changes in rates of development but it is much easier in cases of this kind to look back at the mistakes than it is to avoid them in future cases.

Layout and Construction

The commercial study having been completed, it then becomes necessary to decide from the results of this study what portions of the town will be covered by the distribution system, and what allowance will be made for future growth. In this phase of the sequence there exists the greatest difference with the same problem within a city. The optimism that usually exists for city growth must be considerably decreased and the fact accepted that feet of main per customer must considerably increase. Two general means of approach can be used to decide what portion of the town will be initially served.

1. A house to house canvass for customers can be made and only that portion served which will be economic initially.

2. The system can be laid initially to take care of practically the fourth year estimated customers and the real canvass made after the system is actually under construction.

The advantage in the first case is that the first year investment will be a minimum within the town, but has the disadvantage that it may not be the most economic when considering investment outside the town for pipe lines; that it will be difficult to take on new customers because of the pipe line extension required in each case; that the total investment over a period of time will be greater because of piecemeal construction; and that customer additions will be slower for the reason that all customers necessary to justify a certain extension will not be available at the same time. In each new town it is quite natural that the inhabitants already have facilities for performing the same duties that would be performed by the gas and for their own economic reasons, many will not change over to the new commodity at once. Their stoves and heaters will not wear out at the same time. The customers must therefore be acquired at the opportune time and the facilities for doing this must be available. Many of the prospective customers who, in the house to house canvass, will promise to take gas and who will even sign an application, will not actually take gas when the commodity is first made available.

Plan two has the distinct advantage of its higher first two years investment cost, but overcomes to a great extent the

Table No. 1

Group	No. of Towns in Group	Group Population	Customers Obtained 1st Year	Est. No. of Customers 4th Year	% Obtained 1st Year
A	2	1188	105	210	50
B	2	3009	155	315	49
C	5	8783	645	1125	57
D	7	20351	515	2435	21

*Presented at the Annual Convention of the Southern Gas Association, New Orleans, La., May 3-5, 1932.

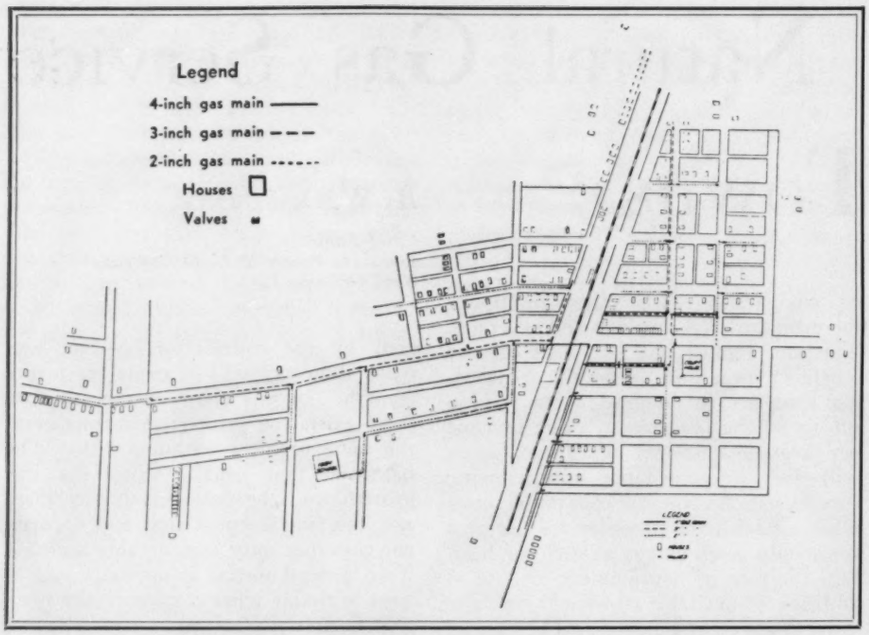


Fig. 1. Town gas distribution system, population 1,200.

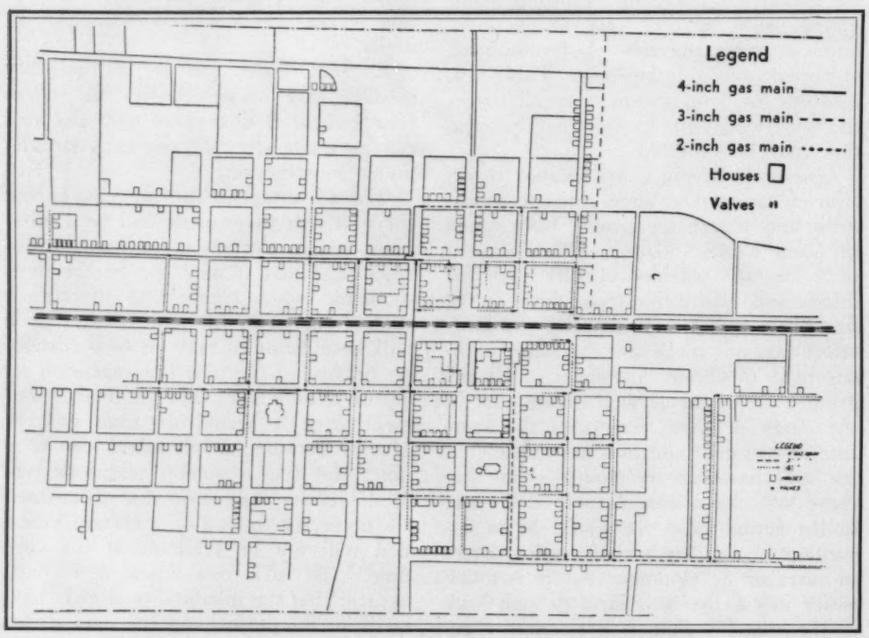


Fig. 2. Town gas distribution system, population 2,500.

disadvantages outlined under Plan one. The two plans must be considered in each individual case and decision reached as to the one to be actually used. Under either plan the engineering layout should cover the town so that whatever portion is constructed will fit in with the final system. During actual construction extremely doubtful sections can be canvassed and be either allowed to remain or eliminated.

If the system is ever expected to pay out, economy must be the keynote of design and such materials chosen as to insure the estimated life with small maintenance requirements to prevent losses. The intermediate pressure system more readily adapts itself to the small town class of service. The layout for the average small town can consist of one trunk or main feeder through the section of more concentrated load with laterals extending in both directions to cover the required area. The main feeder, unless required because of industrial load, will seldom need to be larger than 4-inch with laterals as a general rule of 2-inch. In some instances, laterals smaller than 2-inch might suffice, but 2-inch is recommended as a minimum because of the possibility of internal clogging. Since the intermediate pressure does not require construction to a grade, considerable saving in cost can often be made by dodging pavement.

Figs. 1 and 2 show layouts for typical small towns. The town in Fig. 1 has a population of 1,200 with 175 possible customers. A total of 18,500 feet of main was required in this construction, representing an average for the fourth year estimated number of customers of 106 feet. The town in Fig. 2 has a population of 2,500 with 370 possible customers. The main in this town is 41,000 feet, and the customer average 111 feet. By keeping main sizes down the investment cost per customer can be kept within an amount to make a return on the investment possible. It can readily be seen that a great amount of optimism was not used in the design of these systems. Most small towns in the South have been small towns for a great number of years and most of them will be the same many years from today. It is true a few of them will grow, but with an intermediate pressure system, it is quite an easy matter to increase capacity by running another trunk feeder probably parallel to the initial feeder along much the same plan as the first area covered. Capacity of a system can be considerably increased by increasing pressure and if the proper care is taken in the selection of materials and in the construction to insure tightness, no harm or seriously increased losses should result. Some companies make it a practice to construct intermediate pressure systems in the residental sections and low pressure systems in the business sections or so-called fire zones. Such may be required in some towns by ordinance, but unless legally required, there can be no good reason for the change in pressure.

From the main the customer service is typical, having generally a positive cut off cock at the curb property line, individual regulators, meters, and low pressure cut off on the customer's side of the meter. It is customary that the distributing company stand the cost of meters, regulators, and that portion of the service line from the feeder to the property line, and the customer the cost of the service line from the property line to the meter and the fuel line from the meter to the appliance. The service line on the customer's premises is usually laid by the company at a stipulated price per foot so as to insure tightness up to the meter. The running of the fuel line is generally done by the local plumber either in accordance with local ordinance requirements or in accordance with rules of the company applied through cooperation with the plumber.

Gas being a new and unknown commodity, it must be introduced with a

(Continued on Page 44)

Pacific Coast Gas Association

Managing Director: Clifford Johnstone

Association Headquarters: 447 Sutter St., San Francisco

President: Jas. L. Stone

Vice-President and Gen. Manager, Spokane Gas and Fuel Co.

Convention Committees Actively at Work

THE change of our Convention location from Spokane to Del Monte has required a quick re-alignment of plans. General Convention Chairman T. W. Snell has risen to the occasion in a most magnificent way and announces that the Thirty-Ninth Annual Convention which will open at Del Monte on the morning of August 24 will maintain the high reputation held by Conventions of this Association for interest, instruction and good fellowship. Mr. Snell's chief difficulty is proving to be the necessity of crowding all of the good things he has in store for us into the three days allowed for the Convention by the Board of Directors, and in fact he has found it impossible to crowd the Golf Tournament in during these three days and has made arrangements to hold it on Saturday, the day following the Convention.

T. W. Snell
General Convention Chairman

Del Monte is unquestionably one of the most favored spots in California, which means the world. Especially is it popular with the ladies and they are all most cordially invited by our gracious hostess, Mrs. James L. Stone, to attend this Convention.

The first general session will be held in the morning, August 24, so those attending the Convention should make arrangements to arrive at the hotel before 10:00 A.M. This fits in nicely with the railroad schedule from Southern points. General sessions will also be held in the afternoon on Wednesday, August 24, and on the morning of Thursday, August 25. Thursday afternoon will be devoted to simultaneous section programs. General sessions will occupy both morning and afternoon of Friday, August 26, with the banquet in the evening.

No registration fee will be charged for ladies this year. The men will be asked to contribute the usual $5.00 fee.

Many prominent speakers will appear on the general session programs, and during the progress of the Convention a most sincere effort will be made to discuss all of the more immediate and pressing problems now facing the gas industry. The program committee hopes to be able to publish a complete Convention program in the August issue of *Western Gas*. This issue will also contain many of the committee reports and some of the papers which will be presented during the progress of the Convention.

General Convention Chairman Snell will be assisted by the following committees:

Entertainment Committee: George P. Egleston, Chairman, H. M. Crawford, Frank Bevan.

Registration Committee: P. S. George, Chairman, G. A. Peers, H. W. Meyers.

Golf Committee: W. M. Thompson, Chairman.

Reception and Attendance Committee: Don C. Ray, Chairman, R. R. Blackburn, Ray Cavell, Clyde H. Potter, Monty Pfyl, D. L. Scott, Pierre Vinet.

Hotel and Program Manager: W. J. Crabbe.

Banquet Manager: J. S. C. Ross.

Transportation Manager: E. C. Wood.

Hostess: Mrs. Jas. L. Stone.

Amendments to Constitution and By-Laws

IN accordance with the provisions of the Constitution and By-Laws of the Pacific Coast Gas Association regarding amendments, the Board of Directors of the Association herewith publishes for the information of the members certain amendments to the Constitution and By-Laws which will be offered for approval at the Annual Convention of the Association to be held at Del Monte, Calif., on August 24.

The intent of these amendments is to establish a Manufacturers' Section in the Pacific Coast Gas Association, and in doing this, Class B membership in the Association is restricted to manufacturers of appliances or equipment whose factories are located in the territory of the Association, and a new membership class is created, which will be known as Class C, for manufacturers whose factories are located outside of the territory of the Association.

In the following statement of the amendment, the new provisions are printed in italics:

CONSTITUTION

Article III

Section 1.

Class B. Companies or individuals engaged in the manufacture of equipment or apparatus useful to the gas industry *and who have factories located in the territory of the Association.*

Class C. Companies or individuals engaged in the manufacture or marketing of equipment or apparatus useful to the gas industry *but whose factories or the factories represented by them are located outside the territory of this Association.*

Class D. Individual officers and employees of Class A, Class B and Class C members, consulting engineers and other individuals connected directly or indirectly with the gas industry.

Class E. Professors, teachers and instructors in educational institutions, together with students of gas engineering and allied subjects.

Class F. Individuals, who by reason of accomplishment and service in the gas industry are, in the opinion of the Executive Board, worthy of the title of Honorary Member.

Section 2.

Each Class A, Class B and *Class C* member shall be entitled to appoint one accredited representative who may attend and cast one vote in general session and who shall be eligible to hold office.

Each Class D and each Class E member shall be entitled to cast one vote in general sessions.

Honorary members shall have all privileges of other members except the right to vote and hold office.

BY-LAWS

ARTICLE V

Section 2.

General Committees shall be divided into six Sections, i.e., Accounting, Commercial, Public Relations, Publicity and Advertising, Technical, *and Manufacturers'*, and shall be subject to the direction of the President and the Board of Directors.

The Manufacturers' Section shall study such matters as relate to the design, manufacture, and sale of gas appliances, apparatus or supplies used in or by the gas industry. Subject to the approval of the Board of Directors, the Section may establish regulation for internal self-government and elect its own Chairman and Executive Committee, and may pursue any activities which are not contrary to the objects of this Association.

Section 3.

(Second Paragraph.) The Nominating Committee shall consist of five members—three accredited representatives of Class A members and two accredited representatives of Class B *or Class C* members, none of whom are office holders.

(Third Paragraph.) The Resolutions Committee shall consist of three members—two from Class A and one from Class B *or Class C* members, none of whom are office holders.

ARTICLE VII

Class B Members.

Dues shall be fixed annually by the Board of Directors after consultation with the Executive Committee of the Manufacturers' Section. Minimum $25 per year.

Class C Members—$25 per year.

Class D Members—$5 per year.

Class E Members—$2.50 per year.

Class F Members—No dues.

Nominating Committee Submits Report

IN compliance with Article III, Section 1, of the By-Laws of the Pacific Coast Gas Association, the Nominating Committee reports that it will nominate the following members of the Association, for the offices designated, at the annual election which will take place at Del Monte, August 24, 1932:

For President:

H. L. Masser, Vice-President and Executive Engineer, Los Angeles Gas and Electric Corporation.

For Vice-President:

Geo. P. Egleston, General Manager and Treasurer, H. R. Basford Company.

For Treasurer:

D. G. Martin, Auditor, Pacific Gas and Electric Company.

For Directors:

Andrew L. Kerr, President, Steiger & Kerr Stove & Foundry Company.

C. H. Potter, Commercial Manager, Southern Counties Gas Company.

Don C. Ray, Manager Public Relations, Pacific Gas and Electric Company.

H. M. Thomas, General Manager Northwest Cities Gas Company.

(Signed)

Nominating Committee.

C. B. Babcock, H. R. Basford, E. L. Hall, W. S. Yard, F. H. Bivens, Chairman.

Article III, Section 2, of the By-Laws provides that the submission of names by the Nominating Committee shall not debar any member from making nominations for any and all of the separate offices, which nominations, if seconded, shall be submitted for balloting at the same time and in the same manner as those of the Nominating Committee.

Pipe Protection Subject of Conference

A conference on the subject of pipe protection from soil corrosion was held in Los Angeles on June 14, in the auditorium of the Los Angeles Gas and Electric Corp. building. The conference was attended by nearly a hundred men including representatives from gas, oil, water distributing companies of Southern California, and many equipment firms in these fields. It was held at the call of the Pacific Coast Gas Association's Technical Section. W. M. Henderson, superintendent of gas distribution for the Los Angeles Gas and Electric Corp., was instrumental in arranging the conference, this being the third annual corrosion meeting in the Los Angeles area.

Four principal discussions were on the conference program, the first being by F. A. Hough, distribution engineer for the Southern Counties Gas Co. Mr. Hough described in detail the plan of protection adopted for the San Diego natural gas line which his company is now constructing. This paper appears in the current issue of *Western Gas.*

"Experience with Cast Iron Pipe" was the title of a paper by C. P. deJonge of the San Diego Consolidated Gas and Electric Co. Microphotos and field views illustrated this feature, which will be published in the August issue.

K. H. Logan, chief of the underground corrosion section, U. S. Bureau of Standards, was a feature speaker at the conference, reviewing observations, made in recent inspection of burried pipe samples at many points throughout the country, in the cooperative corrosion program which the Bureau is conducting. Samples of new pipe alloys were buried in the Los Angeles area during Mr. Logan's visit to the west coast.

R. C. Terradell of the Los Angeles Gas and Electric Corp. also read a paper by H. S. Christopher on the subject of "Adherence Characteristics of Pipe Coating Bitumens." Mr. Christopher, formerly on the staff of the Southern California Gas Co., is now with the Bureau of Standards.

Ground Breaking Ceremonies for San Diego Gas Transmission Line

WORK on the new 80-mile, 12-inch transmission line to take natural gas from central and southern California fields to San Diego and other cities on the San Diego Consolidated Gas and Electric Co.'s system was begun at Oceanside, Calif., on June 6, with ground breaking ceremonies by the Southern Counties Gas Co., constructing the line, and San Diego Consolidated. F. S. Wade, president of Southern Counties, took his place at the throttle of a ditch digger and W. F. Raber, president of the San Diego utility, took a shovel and turned the first dirt for the trench.

Lindgren & Swinerton, Inc., Los Angeles, has the contract for construction of the section extending north from Rose Canyon to the boundary line between San Diego and Orange counties. The company has placed Edward F. Fitzgerald in charge, with operating headquarters for the job at Oceanside. The California division of H. C. Price, Inc., electric welding contracting firm of Bartlesville, Okla., has been awarded the electric welding contract by Lindgren & Swinerton, Inc., for the 45-mile section.

Work on the line will proceed at a number of points simultaneously, with four ditching machines in operation. An extensive program of pipe protection is an important part of the project, as described on page 14 of this issue of *Western Gas.*

Gas and Electric League of Nogales is Cooperative Enterprise

The Gas and Electric League of Nogales has been formed, with L. H. Creed as general manager, and has set up a permanent display of gas and electric appliances, according to W. H. Grove, manager of the Public Utilities Consolidated Corp. of Nogales, Ariz. The organization is comprised of dealers in cooperation with the gas company. The display is conducted in a newly renovated store building, and was opened on June 4 with the public invited to attend.

1932 Calendar

July

Michigan Gas Association—Annual Convention, Grand Hotel, Mackinac Island, Mich., July 5-7, 1932.

Summer Course in Household Gas Appliances—American Gas Association in Cooperation with Columbia University, at Columbia, July 5-22, 1932.

Southern California Meter Association—Los Angeles, Calif., July 28, 1932.

August

Pacific Coast Gas Association—Thirty-ninth Annual Convention, Del Monte, Calif., August 24-26, 1932.

October

American Gas Association—Annual Convention, Atlantic City, N. J., October 10-14, 1932.

National Bottled Gas Association—The next meeting to be held at Atlantic City, N. J., in October, during A. G. A. sessions.

Common Purchaser Act Is Held Invalid

THE Federal District Court of Texas on June 8 rendered a decision holding unconstitutional the State Legislature's recent act to make natural gas pipe line companies common purchasers, and to compel them to buy gas ratably. The measure passed by the legislature was known as the Common Purchaser Act, and would empower the State Railroad Commission to regulate pipe lines and require their owners to purchase gas and oil ratably from all wells in the field touched by the lines. The court decision affected only those provisions of the law concerning natural gas.

The holding was on application of the Texoma Natural Gas Co., the Cities Service Gas Co., the North American Oil and Gas Co., and the Panhandle Eastern Pipe Line Co. for an interlocutory injunction restraining the commission from enforcing its regulations against them.

The judicial opinion stated that the Common Purchaser Act amounted to "taking private property for public use without just compensation, inconsistent with the due process of law clause of the fourteenth amendment to the constitution."

Following are other extracts from the court's conclusions:

"The Act is all embracing and includes both common and the private carrier of gas by pipe line. The carrier's private status is changed to that of public by the declaration of the Act alone. The Legislature is without power to do this."

"The plaintiffs are engaged exclusively in producing, selling and transporting gas from the State of Texas for delivery to purchasers in other states, under contracts made prior to the enactment of the statute. These are the essential elements of interstate commerce."

"While the Act purports to conserve oil and gas as natural resources of the State, defendants concede that plaintiffs' operations do not result in waste. The State cannot burden interstate commerce under the guise of police regulation."

"The Act requires a private carrier engaged in interstate commerce to assume the responsibilities of a common carrier and those of a common purchaser. This invades the field of Federal cognizance, interferes with and burdens the commerce between the states, contrary to Art. 1, Sec. 8 of the Federal Constitution."

New Rate Schedule for Detroit in Effect

DETROIT City Gas Co., Detroit, Mich., announces a reduction in gas rates of 2 cents per M.c.f. on the initial 79-cent rate. This step is in anticipation of the advent of natural gas through a new 20-inch line scheduled to be constructed from Columbia System's 24-inch carrier from the Texas Panhandle. It is estimated that the cost of the line and changes in Detroit's distribution system will be about $8,500,000.

The new rate went into effect recently and will represent an annual saving of approximately $850,000 to Detroit consumers, being the lowest rate for manufactured gas in a city of its size in the United States, according to a statement credited to W. G. Woolfolk, president of the Detroit City Gas Co.

Several sources of supply have been mentioned as possible for Detroit's natural gas, and present plans indicate that a line will leave the Columbia Gas and Electric Co.'s carrier at a point near Rockville, Ind., and will extend almost due northeast to Detroit, serving Fort Wayne and other markets en route. It is reported that the line would be constructed by United Light and Power and Columbia interests.

Detroit City Gas Co. is a subsidiary of American Light & Traction Co. of Chicago, which is in turn affiliated with United Light and Power Co. It is reported that United Light and Power Co. has been negotiating for an interest in the Panhandle Eastern Line from Texas fields.

Employee Report System for Puget Sound Power

PUGET Sound Power and Light Co., which has gas properties at Bellingham and Wenatchee, Wash., has introduced an employees' "tip system" for reporting sales leads and service conditions, according to C. P. Johnson, district superintendent at Bellingham.

No commission is given employees for prospects' names, but a point basis and organization of employees into teams are proving effective in keeping up a keen interest. Small booklets of individual report slips were issued about three months ago, and the 250 employees in the Bellingham district alone have turned in some 2,000 reports since that time.

Employees are requested to submit the slips to the manager's office, calling attention to the following: Prospects for appliances; comments or complaints relative to service; instances of unsafe conditions in equipment; suggestions for bettering customer relations, operating economies, employee welfare.

Craig, Colo., Celebrates Advent of Natural Gas from Fields Nearby

Craig, Colo., held a celebration on June 18, when natural gas service was inaugurated there. The Rocky Mountain Gas Co. on that date completed its operations in bringing a 3-mile gas transmission line to the town and constructing a distribution system. All meters throughout the town were expected to be in service by July 1. It is estimated that there will be approximately 400 meters in service shortly.

Cain Asks Roodhouse Franchise

A. H. Cain has asked for a 20-year natural gas franchise in Roodhouse, Ill.

Birmingham Gas Co. Holds "Style Show" of Appliances

The Birmingham Gas Co., Birmingham, Ala., recently closed a "Style Show," featuring the introduction of new models in gas ranges for spring showing. Several hundred guests registered during the event, which was restricted to evening hours and Saturday afternoon. The event was climaxed by the award of a gas range as an attendance prize.

Each manufacturer's product was displayed in an attractive booth in the lobby of the gas company. Electrolux gas refrigerators were also on display.

The Style Show was followed by a community cooking school during which an automatic gas range was used in the demonstrations. While the cooking school was in progress, the Birmingham Gas Co. began an intensive gas range campaign, continuing the sale for four weeks. Prospects secured at the Style Show and cooking school were followed up with direct mail literature and calls by salesmen.

Minnesota Northern Natural May Supply Rochester Soon

A recommendation that the Minnesota Northern Natural Gas Co., subsidiary of Northern Natural Gas Co., be granted permission to construct and operate a natural gas distribution system in Rochester, Minn., was approved on June 15 by the Rochester city council. The recommendation calls for a 3-year contract with the company, with the city having the privilege of taking over the system at the end of that time.

Northern Natural's pipe line subsidiary, Northern Gas and Pipe Line Co., of Omaha, Neb., completed extension from the Mason City-Owatonna Line of the company some time ago.

To Change System to Natural

Central States Electric Co., Cedar Rapids, Iowa, is planning to change its system at Creston, Iowa, to natural gas.

New Briquet Boosts Sales for Portland Gasco

As a result of the development of a new briquet, and a strong supporting sales campaign, the Portland Gas and Coke Co.'s briquet sales are almost 30 per cent above those of last year. The new Gasco Briquets, which have been marketed since the middle of April, are "pillow" shaped and are coated with a special preparation which reduces odor and makes for cleaner handling. Advertising is carried on briquets in newspapers, billboards, car cards, theatre programs and over the radio. In May of this year 2966 tons of briquets were sold, compared to 2285 tons in May of last year.

Production of Carbon Black Declines in 1931

Carbon black production during 1931 amounted to 280,907,000 pounds, which represents a decline of 26.1 per cent from the record total of 379,942,000 pounds in 1930. This was the first annual decrease recorded since 1925. The material decline in output in 1931 resulted chiefly from the curtailment of operations made necessary by stocks accumulations from preceding years.

Domestic sales of carbon black in 1931 amounted to 161,712,000 pounds, a small decrease from the 1930 total. Exports showed a gain of 14.8 per cent in 1931 and rose to a new high mark of 96,714,000 pounds. Combined domestic and foreign sales in 1931 totaled 258,426,000 pounds, or nearly 7,000,000 pounds more than in 1930.

Three Minn. Towns Named for Service

Claremont, Mantorville and Byron, Minn., expect to have gas within two months from the lines of the Northern Gas and Pipe Line Co., headquartered at Omaha, Neb.

Mineral Water Co. Unique Gas User

By J. M. Kaufman

Industrial Department, Lone Star Gas Co.

One of the most unusual industrial gas consumers of the Community Natural Gas Co. of Dallas, Texas, is the Marlin Mineral Water Company, Inc., supplied from the company's line at Marlin, Texas. From the famous hot mineral water of this resort city, crystals and concentrated mineral water are now being manufactured for distribution over a large area.

Discovery was made of this mineral water about 35 years ago when an attempt was made to locate a supply of pure artesian water. The water comes from wells penetrating more than one half mile below the earth's surface at an estimated flow of 380,000 gallons daily and with a pressure of over 50 pounds per square inch. It is interesting to know that natural gas, coming from below the earth's surface originating at possibly a similar depth and transported a distance of approximately 200 miles, is utilized in reducing this mineral water to the crystallized form. The use of natural gas plays an important part in the crystallization process of this water due principally to the uniform temperature afforded by this fuel. To obtain these crystals the water is boiled to a certain density and allowed to cool until the crystals are formed. The evaporation of the water is accomplished by means of large copper vats and an even distribution of natural gas heat.

At the present time, three large vats and two small vats are in use for an operating period of 24 hours daily. Heat is applied directly to the large vats and the hot flue gases are relayed to the smaller vats. By this manner of application, much heat value is utilized that would ordinarily be wasted. The water flowing into the large container is regulated in order to keep the level constant. When the desired density is reached (10° Baume at 212° F.) the concentrated water is transferred to the smaller vats and allowed to evaporate further until it has reached a specific gravity of 22° Baume at 160° F. The super-concentrated water is placed in cold storage vaults in small pans and is allowed to crystallize in a temperature of about 40° F. After remaining in storage vaults from 6 to 8 hours, large stalactite crystals are formed. They are then cut into smaller crystals and packed in boxes of one-half pound. These boxes are then wrapped in cellophane to eliminate further dehydrating or absorption of moisture. This feature insures a consistency of crystals in each package.

The use of natural gas in the manufacture of this product has proven very satisfactory. The gas is so regulated that the desired volume of water is evaporated within a given time. The period of evaporation in both the large and small vats is simultaneous; that is, when the water in the smaller vat has reached the desired density, the water in the large vat is ready to be transferred to the smaller vat for final evaporation. The time required for evaporation is approximately 10 hours, allowing two full cycles each day.

Range Sale Directed at New Customers

Concluding a gas range special selling event at its seven district offices, on May 31, the Northwest Cities Gas Co., Walla Walla, Wash., not only disposed of 115 ranges—which was a fine showing for a six-weeks' campaign on a 9,000-meter system—but in this 115 sales added a total of 71 new gas customers.

This result was not incidental, for the campaign was aimed particularly at new users. The company's territory, like most Pacific Northwest points, is one of strong electric competition, with a high saturation of wood and coal users also. Therefore, in setting up a point system for gauging sales accomplishment during the campaign, more credit was accorded for replacing electric and solid fuel ranges than for replacing old gas ranges.

In detail the point plan for replacing gas, solid fuel or electricity was as follows:

Appliance	Points for Replacing Gas	Points for Replacing Solid Fuel	Points for Replacing Electricity
Cookers	50	100	150
Ranges without controls	75	150	300
Ranges with controls	100	200	400

Apartment house sales to count 50 per cent of domestic sales.

Showing the emphasis which the above point plan placed upon new customers and replacements, the campaign ended with 71 new consumers, 7 electric ranges replaced with gas ranges, and 34 solid fuel ranges replaced.

District competition was encouraged by setting up a district manager's prize based upon sales rather than the above point system. The prize offered was a pig skin traveling bag, which went to I. C. Hocker, district manager at Yakima, for his district's attainment of 333 per cent of its quota. Three salesmen's prizes for selling largest per cent of quota were, first, an imported calf skin traveling bag; second, a cow hide brief case; third, a bill fold. Respective winners were Mr. Watness, salesman at Yakima, Mr. Long of Walla Walla, and Mr. Hirte of Lewiston.

Two feature ranges, selling at $87.50 and $99.50, were headlined for the campaign. Promotional publicity and advertising included bill stuffers and range folders mailed to prospects from the prospect file, concerted advertising in newspapers, use of tire covers and truck banners on company automotive equipment, together with special window and floor displays at all offices.

Weekly bulletins announcing campaign progress were sent out from Walla Walla, headquarters of the company. Relative sales showings of the seven districts were pictured by the use of gas holders of varying heights, the holder skyline changing in keeping with

number of ranges sold and competitive fuel replacements in each district.

Howard M. Thomas, general manager, and Ray C. Finch, commercial manager of Northwest Cities Gas Co., are justly proud of the company's showing in the recent campaign, feeling that the success achieved is proof that it is logical to so program special selling efforts as to produce gas load where it is most needed.

"Oldest Range" Award in Texas Cities June Campaign

DURING June a special range sale was conducted by the Texas Cities Gas Co. C. K. Patton, general commercial manager for Texas Cities, summarizes the campaign features as follows:

The campaign theme was "cool kitchens with insulated ranges." Insulated ranges were offered for the price of non-insulated during the sale. The feature model was sold at $79.50, with heat control, automatic top lighter, porcelain burners and grates, fully insulated. All other models were discounted 10 per cent. Terms for the campaign were $5 down, and payment over not to exceed 18 months, preference being to 12 months.

No additional trade-in allowance was made, but a special feature was the "oldest range award". To the person turning in the oldest range during the campaign an extra 10 per cent of the purchase price was to be credited on the range selected. Old ranges turned in during the campaign were expected to provide some interesting window displays when placed along side the campaign feature range.

New Electric Ranges Accepted as Trade-ins!

"Central Public Service System News" relates and instance of real salesmanship, which at the same time shows the outstanding preference of the purchaser for gas fuel in cooking. In Montgomery, Ala., the electric utility recently gave away an electric range as first prize in a cooking demonstration. In due course a modern electric range was awarded, with flourishes, from the platform of the city auditorium—whereupon the winner went immediately to the Alabama Utilities Service Co. office and was sold a new Roper gas range by Battle Bell, Jr., company sales representative. The electric range was taken in trade.

Physicians and Dentists Laboratory Installs Electrolux Refrigerator

Electrolux Refrigerator Sales, Inc., Evansville, Ind., reports an interesting installation, wherein the Electrolux gas fired refrigerator plays an important role in a physicians and dentists laboratory in Chicago. The refrigerator is used for the storage of cold packs for immediate use following teeth extractions, tonsillectomies and other minor surgical operations. Patented cold pack devices are used, filled with a liquid that is frozen before application.

York Named Manager at Smithville

T. T. York was recently appointed as manager for the United Gas Public Service Co. at Smithville, Texas.

Texas Cities Gas Co. Sales Survey

TEXAS CITIES GAS CO. each year utilizes practically the full time of its sales force during the months of January and February in survey work, covering every home on its system. This survey forms a background for sales activities during the remainder of the year. The survey, covering El Paso, Juarez, Galveston, Paris, Brenham, and Waco, gives the company a complete and graphic picture of sales possibilities in each city. Salesmen are then able to concentrate on homes actually needing new appliances, and the effectiveness of direct mail advertising is greatly increased by being directed to prospects shown by the survey.

Another advantage provided by the survey is an analysis of sales possibilities in the various cities which, by comparison with previous surveys, gives a check upon the progress made by the company and appliance dealers during the intervening period.

The survey is made by the salesman who has that specific territory to develop. In order that it may be complete, all of the canvass cards are run through an addressograph machine, this keeping each meter route separate so that a salesman completes a meter route entirely before going on to the next route. Extra cards are also filled out by the salesmen for homes which are not now on the service. When the meter route is completely surveyed on the individual cards, the results are tabulated on a summary sheet. After the entire city is surveyed, these meter routes are consolidated into one report, covering first the territory that each salesman has under his jurisdiction and, second, the entire city.

In the larger offices, all of the various prospects are tabulated on the addressograph so that in case of any direct mail circulars featuring specific equipment, all that is necessary is to run the circulars through the addressograph and they are simply sent to those names that are properly tabulated. This simplifies the mailing of circulars and follow-up activity on our prospect list.

The particular reason for the survey's being conducted at this time is that January and February are dull selling months, whereas the balance of the year represents periods when the salesmen can more profitably be employed on sales calls. In addition, during these months, customers are likely to be more dissatisfied than at any other time of the year, and the personal attention given their complaints by salesmen has been found very helpful in maintaining good public relations.

The analysis of one city's survey shows the number of active domestic meters, sealed domestic meters, vacant meter loops, total domestic meters, including active, sealed and vacant—residents on lines having no service, residences on lines having no house piping, prospective domestic consumers possible by extending lines 200 feet per meter, total domestic consumers that could be served including above extensions, residences and stores vacant that are piped for gas, occupied residences and stores piped by not using gas, total number of consumer's survey cards, survey cards on customers not at home—residences that use gas for cooking only, residences that use gas for heating only, appliances using other fuels, the number of residential central heating plants including gas-fired and those using oil, coal, or wood, and the possibilities of extending use of gas through new appliances.

American Gas Assn. Announces Production of Three Educational Films

"The Story of Gas in Three Reels,"—That would be an appropriate title, according to officers of the American Gas Association, for a trio of motion pictures just produced, which give an overall view of the natural and manufactured gas industries.

These three films, produced by the American Gas Association in collaboration with some of its member companies, are of the silent variety, but nevertheless are described as effective and interesting, designed for showing before gas company employees and schools.

The first is entitled "Nature's Perfect Fuel." It is descriptive of the natural gas industry, and includes a number of unusually dramatic scenes of wells coming in and of the laying of great pipe lines. By animation it shows the location of the gas fields and pipe lines in the United States.

The second film bears the title "Ideal Fuel.'" The purpose of this picture is to present a general view of the manufactured gas industry, showing its progress and development; the many uses of gas, both in the home and in the factory.

The third picture is entitled "How Gas Is Manufactured." By animation it shows how coal gas and water gas are made. It was assembled into a 15-minute reel from several films produced by the Rochester Gas and Electric Corp., a part of the Associated Gas and Electric System. Its purpose is entirely educational.

All of these films may be had in both 16 mm. and 35 mm. sizes, on non-inflammable stock, and are available on a purchase or rental basis. Information may be obtained from the American Gas Association, 420 Lexington Avenue, New York, N. Y.

Los Angeles Food Craft Shops Installs Gas Fired Appliances

The Natural Gas Bureau, a cooperative enterprise of the Southern Counties Gas Co., Southern California Gas Co., and the Los Angeles Gas and Electric Corp., all of Los Angeles, recently installed complete gas equipment in the Food Crafts Shops in Los Angeles.

Food Craft Shops is a national organization sponsored by Margaret East-Forbes. The purpose of the company is to display foods and household appliances to women's clubs and other women's organizations.

The gas appliances used are two gas ranges, two automatic water heaters and two gas-fired refrigerators. They are located behind glass partitions and are within view of the guests. Occasionally a representative of one of the gas companies gives a talk at the luncheon or bridge club meetings, pointing out the advantages of a completely gas-equipped kitchen.

New Company Formed to Take Natural Gas to Detroit, Mich.

According to press reports, Peninsular Pipe Line Construction Co. has been incorporated in Michigan for the purpose of constructing a 160-mile gas transmission line from the Mt. Pleasant field to Detroit, Mich. The company is reported to have an authorized capital of $500,000.

Effect of Ambient Temperatures on Gas Measurement

By C. E. PICKUP

*Southern California Gas Company**

THE coefficients used in the measurement of gas are no longer computed by using temperature corrections based on periodical temperature observations from a hand thermometer. Instead, through the commendable work of the research departments of the various instrument companies we have temperature recording instruments giving a permanent record with surprising accuracy of the temperature of the gas measured.

C. E. Pickup

However, it has only been a comparatively short time that "Ambient Temperatures", surrounding temperatures, temperature of the atmosphere, temperature conducted along the outside pipe walls and temperature of radiation, have been fully compensated for in instrument design.

At the present time there are four classes of temperature recording instruments farbicated for use in the measurement of temperature of gases and liquids. They are as follows, accompanied by a brief description and a list of advantages and disadvantages with respect to their use in the measurement of gas temperatures:

Class I—Liquid Filled Type

A. Alcohol actuated:

This recording thermometer operates on the expansion of a liquid and covers a range of from approximately 40°F to 250°F. Generally speaking, these instruments are connected by capillary tubing to a sensitive bulb which is located at a point where the temperatures are to be taken.

Advantages:

(1) Very small bulb reduces errors with properly designed socket and stainless steel extension neck.
(2) Fairly powerful spring.
(3) Some of the recent fabrications come equipped with simplified compensation for ambient temperatures.
(4) Uniform chart.

Disadvantages:

(1) Unless equipped with compensation for ambient temperatures, serious errors may occur.
(2) Some fabricated instruments have capillary tubing length limited to 25 feet.

B. Mercury filled:

Advantages:

(1) Fairly small bulb, but substantially larger than the alcohol filled type, hence there is a possibility of somewhat greater conductive error.
(2) Very powerful spring.
(3) Uniformly graduated wide open chart which means that the subgraduations can be divided as fine as single degrees.
(4) Compensated tube systems now used on some instruments of this type are not influenced materially by ambient temperatures along the tubing or about the case. (*Note*: This compensation is usually effected by special type of connection tubing or a separate gas actuated system).
(5) Very ruggedly constructed connecting tubing, usually made of a steel, not easily broken under ordinary usage.

Disadvantages:

(1) Unless compensated tubing systems are used, serious errors may exist due to ambient temperatures.

Class II—Vapor Tension Type

This type of instrument is constructed with a closed system in which the bulb is partially filled with a liquid. As the temperature rises a vapor is generated which builds up a pressure which in turn is transmitted to the pressure element by means of a capillary tube.

Advantages:

(1) Fairly small bulb.
(2) Fairly powerful spring.
(3) Extremely sensitive—records the slightest temperature variations immediately. The time lag is negligible.
(4) Permits the use of a chart, although not uniform in graduation, which has very wide and open graduations at the working range.

Disadvantages:

(1) Special calibration is necessary for each installation. *Eg.* If the bulb is to be located above or below the recorder the relative distance must be known and the instrument calibrated for that position. This calibration is necessary because under some conditions the actuating vapor in returning to the liquid state remains in the capillary tubing and acts as so much head of liquid on the pressure element.
(2) Ambient temperatures at the capillary tubing can only be compensated for when the temperature at the tubing does not exceed the temperature at the bulb by approximately 40°F.

Class III—Gas Filled Type

This thermometer operates according to the law of expansion of perfect gases. The gas used is usually nitrogen, the capillary being filled under pressure and sealed.

Advantages:

(1) Uniform chart.
(2) Ambient temperature at capillary tubing does not effect pressure element. The bulb in this instrument is so designed that there is a definite ratio between the volume of the bulb and the volume of the capillary tubing. The volume of the bulb is so great in comparison to that of the capillary that an increase in pressure due to an increase in temperature at any point along the connecting tubing will be absorbed in the relatively large volume in the bulb and not effect the working element.

Disadvantages:

(1) Small power in spring.
(2) Possibility of serious conduction errors due to large bulbs.

In the selection of temperature recording instruments one must consider all the possible working conditions—one particular type of instrument may give better results under some conditions than others. It would certainly be grossly unfair to condemn any instrument which was found in error under specific conditions when there are possibly numerous other conditions under which it would perform perfectly.

Kettleman Hills Tests

In an attempt to discover at least to some extent just what effects ambient temperatures have in the records produced from different temperature recording instruments, a series of tests were run on dry gas from an absorption plant in Kettleman Hills.

Before entering into the detail of the set-up accommodating these tests, it might be of interest and add light to the following discussion roughly to trace the gas flow from the wells, through the absorption plant and to the sales header.

In most cases the wet gas from the traps at the well is transmitted to the absorption plant via large gathering systems. These gathering systems rarely accommodate a single well but more often supply means of transportation of wet gas produced from an entire district. The wet gas then enters the plant at a temperature of approximately 100°F, where it is introduced into a cooler, the jacket water of which is supplied from the cooling tower pond or from make-up water. Upon leaving the cooler at an average temperature of 84°F., the wet gas then passes through a scrubber where great quantities of condensate are recovered due to the loss in temperature and scrubbing effect. From this point the wet gas goes directly to the absorber at approximately the same average temperature where it picks up temperature of absorption and passes out as dry gas into another scrubber at an average temperature of 88°F. From this final scrubber the dry gas goes directly into sales headers. The above quoted temperatures are the average temperatures existant during the time of tests. They are not yearly average.

From the foregoing discussion it can be seen readily that there are many possibilities of temperature changes in dry gas leaving gasoline absorption plants. Atmospheric changes and general weather conditions are perhaps responsible for 90 per cent of the actual gas temperature fluctuations. However these actual gas temperature changes must not be confused with ambient temperatures

*Presented before the Southern California Meter Association, May 26, 1932.

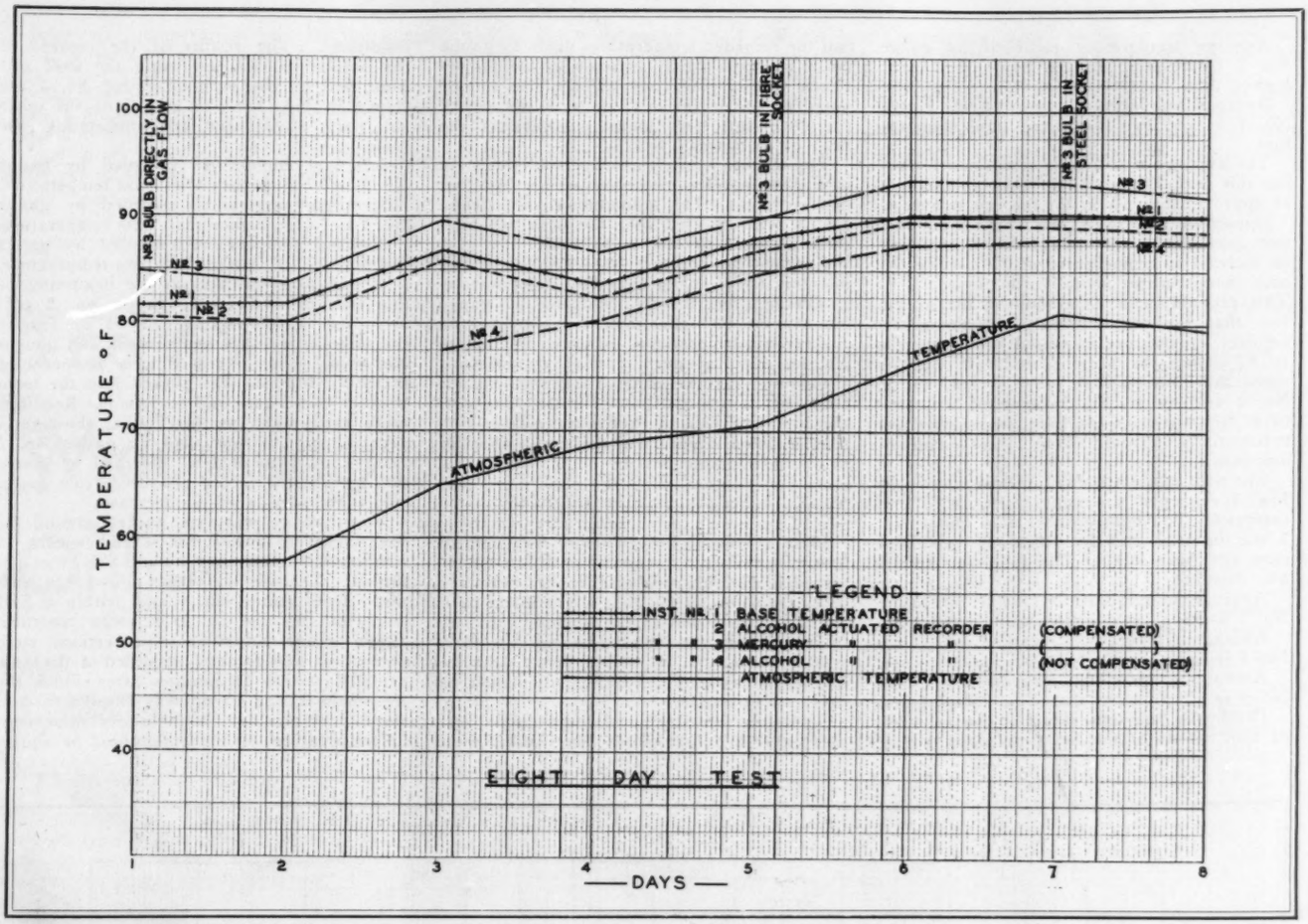


Fig. 1.

ment existant subsequent to the gas leaving the plant.

The location for the running of the following tests was chosen at a measuring station composed of seven orifice meter tubes supplied from an intake header situated approximately 300 feet from the sales header of an absorption plant. A 10-inch orifice meter tube was selected in this set-up which carried practically the same pressure as the plant sales header and passed a fairly uniform load of approximately 7,000 M.c.f. daily. The tube was of standard size and was installed with straightening vane. Four thermometer connections were installed on the downstream tube of this meter run; the first a 1-inch pipe well, welded to a 1-inch coupling at a distance of 17 feet from the orifice plate; the second, a 1-inch coupling (open hole) six inches farther down stream; the third a 1-inch coupling (open hole), another 6 inches downstream and a fourth a 1-inch pipe well welded to a 1-inch coupling still another 6 inches downstream. For the sake of clearness in the subsequent discussion, these wells, accommodating instruments used will be known by number, number 1 being the nearest the orifice meter plate and number 4 the farthest away.

Number 1 well, accommodated a standard (nitrogen filled) hand thermometer immersed in mercury and graduated to 1°F. Quarter hour readings from this thermometer were used as the base temperature for all comparisons.

It might be of interest at this time to mention that a direct connected mercury thermometer was installed at the outlet of the sales header at the absorption plant as a check on the observed base temperature at the measuring station. A comparison between these two records showed a very close check, at no time was there a difference of more than 1°F.

Number 2 well accomodated an alcohol actuated temperature recording instrument designed especially to combat ambient temperatures. The stainless steel socket and aluminum fin was screwed directly into the line through a 1-inch coupling. Into this socket the very sensitive bulb was inserted and made up securely by means of a stainless steel union from which the copper covered capillary tubing went directly to the temperature recording instrument. Throughout the observations this instrument was left in the same condition and position.

In number 3 well there was installed a mercury actuated instrument having a compensated capillary tubing system. The comparatively small and fairly sensitive bulb was subjected to gas temperatures under three distinctly different conditions. First, the bulb was inserted into the line through the 1-inch coupling and fastened by a steel adapter or union hub nut. This enabled the bulb to be directly subjected to the gas flow. Second, the bulb was inserted into a steel and fibre socket, screwed into the line through the 1-inch coupling and fastened by a steel union connection and swivel nut.

The steel and fibre socket is designed to eliminate radiation errors or temperatures of gas adjacent to the inside surface of the pipe. Third, the bulb was inserted in a separate steel well which was screwed into the 1-inch coupling and fastened by a steel union connection swivel nut.

In number 4 well there was installed an alcohol actuated, direct connected instrument, the bulb of which was immersed in a light oil bath, contained by the 1-inch pipe well. The bulb, union hub nut and conductor tube of this instrument was of copper composition, while the reducer used was an ordinary ¾-inch x 1-inch steel pipe fitting. This fact is to be kept in mind in the analysis of the accompanying graphs, for it has a direct bearing on the results shown. All instruments used in the following tests were calibrated throughout their entire length in a common bath.

Readings and Observations

The first test, covering a period of 8 days consisted of the recording of quarter hour readings and observations of the records produced by the three previously explained recording thermometers. The base temperature and atmospheric temperature was likewise read and recorded for the same periods.

As a matter of convenience the temperature recording gauges mentioned in the explanation of the accompanying graphs will be referred to by number. Namely: No. 2 instrument, alcohol actuated gauge especially designed to combat ambient temperatures. No. 3 instrument, mercury actuated gauge with compensated capillary tubing case. No. 4 instrument, alcohol actuated, direct connected gauge.

The first three days' record shown in Fig. 1 give the following results:

Average temperature recorded by gauge No. 2 is 1.25°F. lower than the average base temperature.

Average temperature recorded by gauge No. 3 (plain bulb in gas flow) is 2.68°F. higher than base temperature.

Average temperature recorded by gauge No. 4 is 6.45°F. lower than base temperature.

The average atmospheric temperature during this period was 62.2°F. with an increase of approximately 10°F. for the last two days.

Inspection will show that during the last two days of this test, gauge No. 4 recorded an increase in temperature of 2.7° while the base temperature actually decreased 3°F. This probably can be accounted for in the fact that the atmospheric temperature, an ambient temperature increased approximately 10°F. during the same period. It will be noted that during that same period, gauge No. 2 and gauge No. 3 recorded temperatures different from the base temperature not substantially greater than their average amounts.

The fifth and sixth days' records shown in Fig. 1 represent the same set-up with one exception. The bulb connected to gauge No. 3 was inserted into the previously explained steel and fibre socket. The following results are shown:

Average temperature recorded by gauge No. 2 is 0.8°F. lower than base temperature.

Average temperature recorded by gauge No. 3 is 2.5°F. higher than base temperature.

Average temperature recorded by gauge No. 4 is 3.1°F. lower than base temperature.

Practically the same analysis can be made of this test as of the first four days, noting that the recorded temperatures made by gauge No. 4 shows a steady increase as the atmospheric temperature rises. There also can be noted no particular advantage in the use of the fibre and steel socket surrounding the bulb of instrument No. 3.

The seventh and eighth days' records shown in Fig. 1 represent the same set-up with but one exception. The bulb connected to gauge No. 3 was inserted into the separate steel well. The results are as follows:

Average temperature recorded by gauge No. 2 is 1.3°F. lower than base temperature.

Average temperature recorded by gauge No. 3 is 2.4°F. higher than base temperature.

Average temperature recorded by gauge No. 4 is 2.4°F. lower than base temperature.

Substantially the same reasoning can be followed in the analysis of these results as the first two tests with no appreciable difference noted while using the steel socket for the bulb of gauge No. 3.

Testing Equipment Packed in Ice

In an attempt to prove further that ambient temperatures can cause serious differences in recorded gas temperatures a test was run using the same set-up with orifice meter tube, recording thermometer connections, capillary tubing and gauges packed in ice. A form was built around the orifice meter tube assuring approximately 3 inches of cracked ice covering throughout.

The same three tests and comparisons were made over a period of six hours under these conditions. The results of the records of the portion of this test using the steel and fibre well on the bulb of gauge No. 3 are shown in Fig. 2. The results of the other two parts of this test are substantially the same.

Average temperature recorded by gauge No. 2 is 0.7°F. higher than base temperature.

Average temperature recorded by gauge No. 3 is 3.0°F. higher than base temperature.

Average temperature recorded by gauge No. 4 is 16.3°F. lower than base temperature.

It will be noted that at the beginning of this test, at 10:15 a.m., gauge No. 2 was recording a temperature of 93°F, exactly the same as the base temperature and gauges No. 3 and 4 were recording a temperature of 95°F. The ice was packed into the form between 10:15 a.m. and 10:30 a.m. Readings were then taken at 10:45 a.m. showing a decrease of 2°F. recorded by gauge No. 2 and an increase of 1°F. recorded by gauge No. 3 while the record produced from gauge No. 4 recorded a 28°F. decrease.

Very fine ice was then packed around the connections to gauge No. 4 and within 15 minutes a further decrease of 8°F. was obtained. The ice was then allowed to melt away from gauge No. 4 and within a half hour an increase of 19°F. was recorded. Again gauge No. 4 and connections were packed in fine ice and recorded a decrease of 16°F. within 15 minutes after which the ice on the entire set up was allowed to melt slowly. Within two hours under these con- or temperatures of the atmosphere or equip-

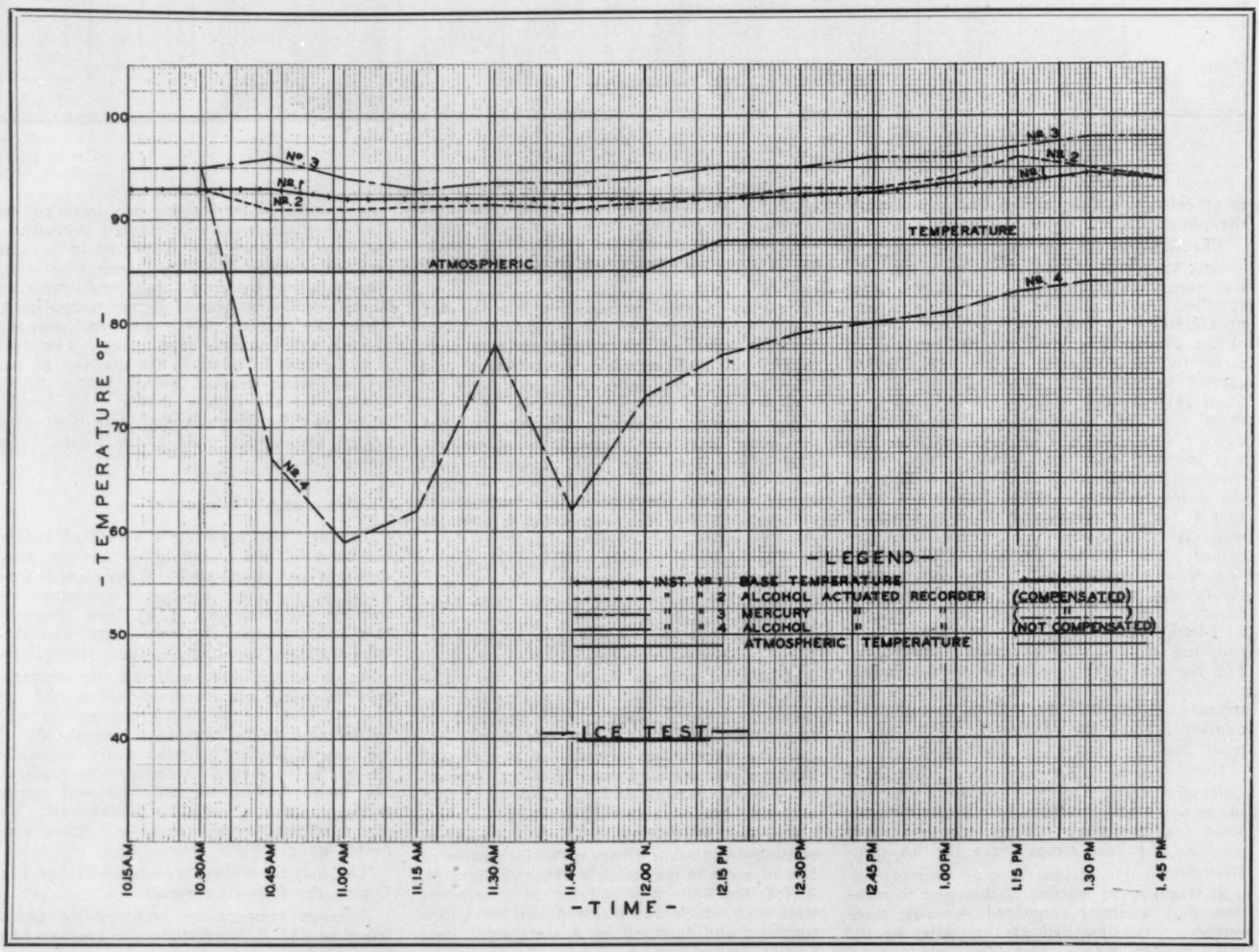


Fig. 2.

ditions the temperature recorded by gauge No. 4 showed an increase from 62°F. to 84°F., or 22°F.

Records produced from gauges No. 2 and No. 3 throughout these tests showed a normal fluctuation probably caused by their ambient temperature compensating systems. The greatest difference recorded between the record produced by gauge No. 4 and the base temperature is shown at 11 a.m., an amount of 33°F. which would cause an actual error in gas measurement of approximately 3.3 per cent.

Therefore let it be said that ambient temperatures are erroneous temperatures in gas measurement. Temperature recording instruments should be chosen with utmost care, for there are accurate instruments fabricated for practically every purpose.

In closing I would like to express appreciation to the following manufacturers for information received and equipment loaned by: The Foxboro Co., Pacific Meter Works, and The Bristol Co.

The Metric Wide-Range Orifice

By K. C. Tomlinson
Assistant Manager
*Pacific Meter Works**

THE operation of a variable orifice was first used with the Linderman Meter, the principle of which consisted in operating an electrically controlled gate valve to vary the size of the orifice, and as the size of the orifice would change, the pressure difference across it would approach the same value it had before the change in differential occurred. In other words, the device would attempt to maintain as closely as possible a constant differential, which in the case of the Linderman Meter is 4½ inches of water column pressure.

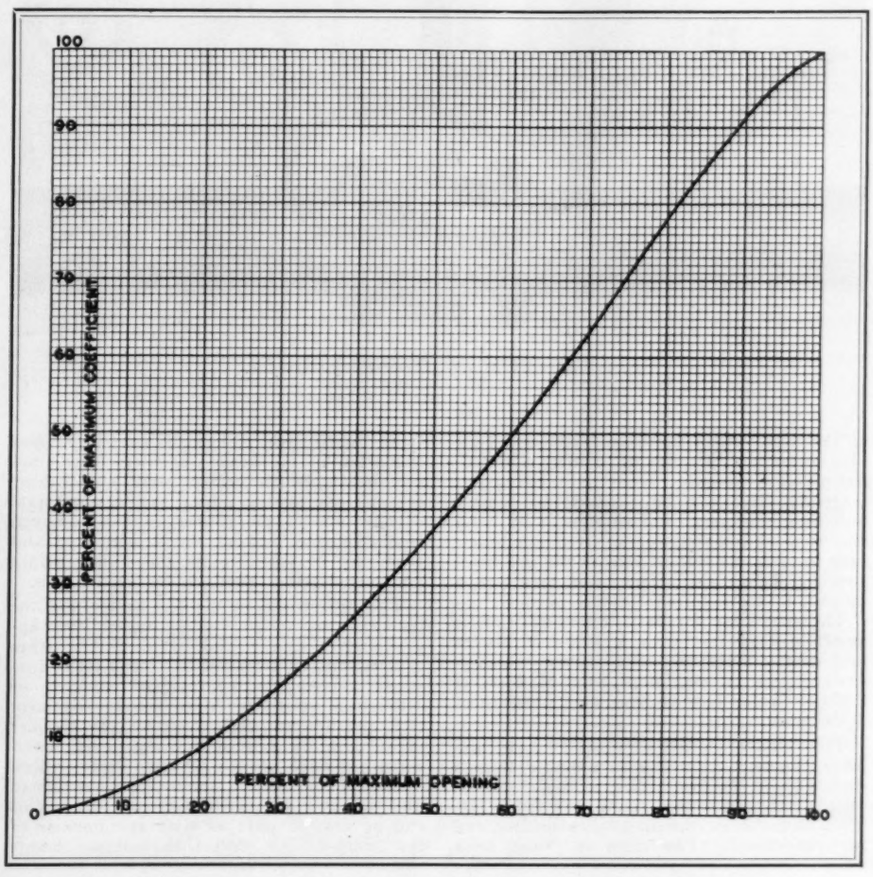
K. C. Tomlinson

When this point was reached, the mechanism changing the orifice would come to a stop; therefore the area of the orifice would depend directly upon the gas demand.

The application of this principle has been successfully used in the Linderman Meter and the volume passing through the orifice transmitted to an integrator which would accumulate the changes in the positions of the orifice, to which the proper coefficient could be applied and the definite volume obtained.

The possibility of using this same device for manual operation was recognized and the Metric Wide-Range Orifice has been perfected and used in sizes from 6-inch up to 12-inch. A particular application of the Wide-Range Orifice Meter is in measuring gas at town border stations and such installations where the rate of flow of gas, steam or liquids is likely to vary over extremely wide limits from time to time; for instance, the use of orifice meters for manufactured and mixed gases in a mixing tank or holder for supply to a gas distribution system where the demand varies over extreme ranges.

A particular example is that of a gas company where seven Wide-Range Orifices are used in connection with integrating orifice meters. In one installation there are two orifices measuring the manufactured and mixed gas to the holder and the resultant gas is measured in three lines leading from the holder to the distribution system. Tests over a period of time show that the two inlet meters check with the three outlet meters within less than 1 per cent over a period of six months. To date, there has been no difficulty in checking measurement with other types of meters.



Curve showing increase in coefficients as Metric Wide-Range Orifice is opened.

In detail, the Metric Wide-Range Orifice is essentially an accurately machined slide which is moved vertically over the face of an accurately machined circular orifice fastened rigidly in a valve body. This square slide is moved upward and downward by a handwheel which rotates around a threaded rising stem of constant lead. Each revolution of the handwheel represents a definite movement of the slide. The maximum play between an opening and closing position is less than 0.002 inch. When the slide is raised, the effective area of the orifice is increased from zero to the maximum area, which is a circular opening.

The handwheel can be locked in position at zero, and at each full turn of the handwheel.

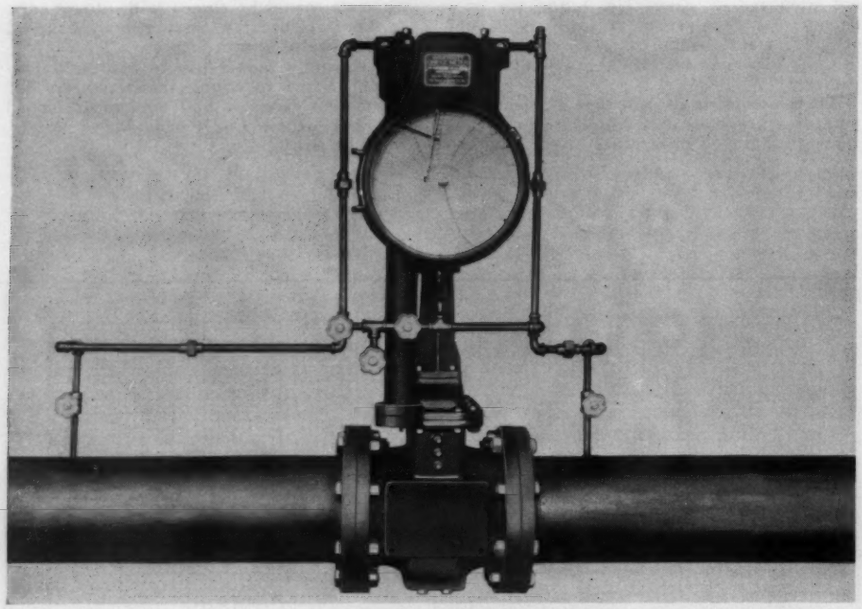
For each size of Wide-Range Orifice, the diameter of the circular orifice is ¾ of the nominal diameter of the pipe and there are 60 locked positions of the slide corresponding to 60 sizes of fixed orifices.

The distance that the slide is above the zero position is indicated by a pointer attached to the stem on a scale fastened to the yoke of the valve. A micrometer scale is engraved on the handwheel, making it possible to read the position of the slide in thousandths of an inch.

The bottom of the casting has a recess for collecting dirt and liquids. A handhole plate in the bottom makes it easy to remove any foreign matter. A valve in the handhole plate permits of drainage. The slide is held against the face of the orifice by machined guides. It is lubricated from the outside by a high-pressure Alemite system which allows free operation of the valve and makes an effective seal against leakage.

In each size orifice, the maximum diameter of opening is ¾ of the nominal diameter

* Presented before the Southern California Meter Association, May 26, 1932.



Installation of Metric Wide-Range Orifice.

of the pipe, which makes a large orifice-to-pipe ratio and permits of smaller differential-pressure losses.

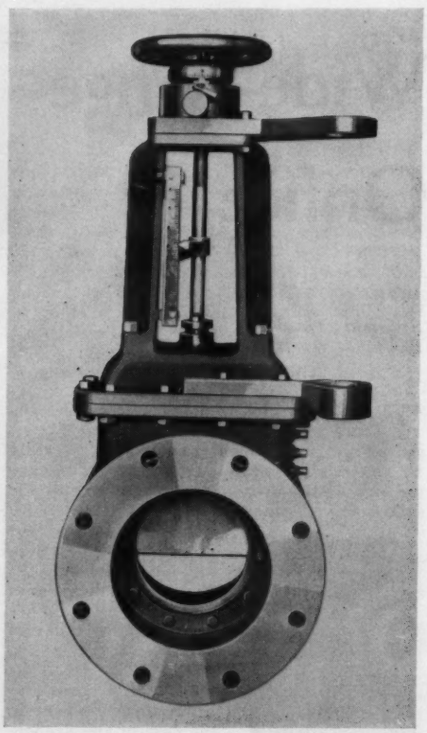
Orifice sizes can be changed by simply unlocking the wheel and rotating it by hand one or more complete turns. It is not necessary to open the line or release the gas pressure to change the orifice, and therefore a by-pass is not required for this purpose.

The coefficient for each locked position is determined by test with a 2000-foot prover and with a multiple orifice prover, which is designed for a maximum rate of flow of 1,500,000 cubic feet an hour at a pressure of 3 inches of water.

This prover consists of three 30-inch lines joined together at a Y with a single 30-inch line leading to the orifice or meter to be tested, and then to the suction of a large fan. Two of the lines contain 17-inch orifices and may be closed. The third is joined to a large funnel which has 61 four-inch lines connected in the head. Each of these lines contains a 2-inch orifice plate and rubber cap for sealing the inlet. For a small rate of flow one of the rubber caps is removed from the inlet end of the 4-inch pipe and room air passes, through the 2-inch orifice and meter being tested, to the suction fan.

The differential at the test orifice and the device being tested can be maintained approximately equal and if desirable other orifices can be installed in the 4-inch lines so as to establish approximate equality of differential readings. With this arrangement it is possible to obtain tests by any number of steps in the rate of flow up to the maximum capacity of the 61 two-inch orifices. Then all of the 61 inlet pipes are closed and one of the large orifices is used. This can be used in parallel with any number of the 2-inch orifices. When the volume change in these is not sufficient, the 4-inch lines are again closed and the two 17-inch orifices are used in parallel. The rate can be increased until all of the 2-inch and both 17-inch orifices are used in parallel.

Suction is preferred in this case because the temperature change due to heating by the fan is eliminated. With this arrangement it is always possible to obtain the same relative accuracy of the reading at the orifice prover and device being tested for all rates of flow from 1000 cubic feet to 1,500,000 cubic feet an hour, eliminating time as a factor and making it possible to obtain the temperature and pressure factors with accuracy.



View of scale and down-stream side of orifice.

The Use of Significant Figures in Measurement Work

AT a recent meeting of the Southern California Meter Ass'n., E. S. Fuller, Utilities Engineer in the Refineries Department, Union Oil Co. of California, led an important and interesting discussion on the use of significant figures in measurement work. Mr. Fuller asserted that much of the time expended in computations is wasted through the use of an excessive number of places of figures, and quoted the following propositions from Holman's "Computation Rules and Logarithms":

Proposition I: "In multiplication or division, the percentage of accuracy of the product or quotient cannot exceed that of the factor whose percentage accuracy is least."

Proposition II: "In addition or subtraction, the result cannot be accurate beyond the first decimal place which is inaccurate in any component."

Mr. Fuller drew many examples from his extensive work in measurement with the U. S. Government and with instrument manufacturers, where seven place logarithms were used, but where perhaps only four or five places were justified.

Mr. Fuller pointed out that use of the 10-inch slide rule, with its accessories, is justified in most orifice meter computations, when it is remembered that most orifice meter measurements are recorded on a chart whose entire scale is about 3¾ inches long, concluding that as great a refinement can be attained in reading the slide rule, as in reading the ordinary orifice meter chart.

It was pointed out that the following two factors have had predominating influence in the increasing use of needless significant figures.

The first factor is the remarkable development in calculating machines with which an expert operator can obtain 16 significant figures almost as readily as the ordinary slide rule can obtain three.

The second factor, according to Mr. Fuller, is the strong influence in measurement work of cost accountants, who naturally think in cents (the one-hundredth part of a dollar) or even in mills, and in their endeavor for balances and increased accuracies, have perhaps induced measurement men to report orifice meter computations, beyond their fundamental limits of accuracy.

The speaker illustrated cases where the law of compensating errors tended to make for correct balances, whereas the law of accumulative errors tended to increase discrepancies where too many places of figures are used.

The purpose of Mr. Fuller's discussion was to create interest and straight thinking on the subject of possible accuracy in measurement work. The concensus of opinion was that certain consistent tolerances should be accepted for all measurements and computations; that in general, four significant figures are sufficient for all correction factors; and that all companies should adopt uniform numbers of significant figures in all computations relating to measurement work.

Officers Elected for Sixth S. C. M. A. Year

HOLDING its annual meeting on June 23 at Whittier, Calif., in the English Tavern the Southern California Meter Association brought into office a new administration which will guide Association affairs during the sixth year of the organization. L. P. W. DesBrisay of the Los Angeles Gas and Electric Corp., and an active worker in S. C. M. A. enterprises since the organization of the Association, is the 1932-1933 president, succeeding P. W. Hill, General Petroleum Corp. C. B. Hartwell, Standard Gasoline Co., holds the vice-presidency. G. S. Duncan of the General Petroleum Corp., secretary for the past year, continues in that office, while H. A. Hurley of the Southern California Gas Co. has been elected treasurer.

L. P. W. DesBrisay

Chairmen of regular committees comprise the balance of the Association directorate. An efficient corps of committee heads will direct the several activities during the year. M. J. Cereghino of the Los Angeles Gas and Electric Corp., who served effectively as program chairman during the first year of the Association (1927-1928) has consented to handle this important post again. F. A. Miller, Southern Counties Gas Co., heads the membership committee. J. A. Smith, Texas Co., is chairman of the entertainment committee; W. W. Warneke, Chanslor-Canfield Midway Oil Co., of the by-laws committee; F. W. Curtis, Shell Co. of Calif., publications committee; and Edgar Valby, Richfield Oil Co., standards committee.

Opening the meeting, P. W. Hill briefly reviewed the year of Association work, and then submitted the report of the nominating committee. The committee was made up of T. K. M. Smith, chairman, B. M. Laulhere, R. F. Angell, B. G. Williams, and F. E. Bradley.

Following unanimous adoption of the nominating committees' selections, President DesBrisay spoke briefly in acknowledgement of his election.

R. F. Angell presented the paper of the evening on "Progress in Measurement", an interesting survey of outstanding developments in measurement and a forecast of the direction in which the industry must advance. His paper will appear in an early issue of *Western Gas*.

A. E. DeBurn announced results of the Association's May golf tournament, of which H. G. Andrews, Southern California Gas Co., was winner.

A number of revisions suggested for the S. C. M. A. By-Laws were discussed by L. Bonner, chairman of the by-laws committee during the past year, the revisions to be acted upon at some future time.

Committee of 61 Appointed to Decide Minneapolis Gas Question

A public utility advisory committee, with a membership of 61 and an executive committee of 17, is considering the various phases of the proposal to introduce natural gas into Minneapolis, Minn. Several phases of the gas situation are being investigated, namely the financial status of the Minneapolis Gas Light Co., now serving manufactured gas there. the relative values of natural and manufactured gas, a study of the business and engineering problems of both public and private ownership and operation, consideration of the legal problems involved in setting up a municipal utility structure, and an inquiry into methods for obtaining a fair valuation of gas company properties in the event that the city decides to take them over.

Gas Sales Up Four Per Cent at Seattle, Washington

Gas sales for the first four months of 1932 are up 4 per cent for the Seattle Gas Co., Seattle, Wash., over the same period last year, according to Jas. F. Pollard, general manager. Sales through April of this year came to 663,224,600 cu. ft.

May Serve Bassano, Alberta

Canadian Western Natural Gas Light Heat and Power Co. may soon begin natural gas service in Bassano, Alberta.

Stein Again Manager of Texas Border Gas Co., Laredo

W. W. Stein, formerly manager of the Texas Border Gas Co. at Laredo, Texas, and later placed in charge of pipe line operations for the United Gas System at Jackson, Miss., is back at Laredo in his former position. J. P. Rogers, manager of the land office of the United Gas Public Service Co., Houston, has been appointed to succeed Mr. Stein at Jackson. R. W. Williams, manager of the company's land office at Jackson, Miss., has been transferred to a similar position in Shreveport, La., his place at Jackson being taken by W. W. Riggs, Jr., of Houston, Texas.

Gain in Gas Sales for First Quarter Reported at Council Bluffs

A large increase in gas sales and gross income for the first quarter of 1932 as compared with the corresponding period of 1931 is reported by the Council Bluffs Gas Co., Council Bluffs, Iowa. Gas sales reached 218,000,000 cubic feet for the period as compared with approximately 50,000,000 cubic feet during the corresponding period in 1931. Gross revenues of the company for the first three months of 1932 were $119,711, as compared with $57,450 in the same period a year ago.

Standard Oil Co. to Build Absorption Plant at Kettleman

Standard Oil Company of California is about to begin construction of a natural gasoline absorption plant near the site of its No. 6 well in the Middle Dome, Kettleman Hills, Calif. The plant will be about one-half the capacity of the company's North Dome plant.

P. G. and E.'s New Financing Schedule

(Continued from Page 17)

"For Example: For an unpaid cash balance of $153.25, use $153; for an unpaid cash balance of $153.75, use $154."

"Amounts shown in unpaid cash balance column may be combined and used to make any possible given amount; likewise the corresponding term balance of these unpaid cash balances may be combined for any term balance and the monthly payments may be combined to make the monthly payment for any term balance.

"For example: If the unpaid cash balance is $752, this figure may be obtained by combining the unpaid cash balances of $500 and $252."

"Discounts: Term balances which have not yet become due will be subject to a discount of ½ of 1 per cent per month for cash in full, based upon the original number of months specified in contract where contracts are made for 12 months or longer. Where contract is made for any period less than 12 months a minimum discount of 6 per cent will apply."

In the adoption of its complete finance plan the Pacific Gas and Electric Co. feels that it has definitely eliminated a field of possible controversy between company and dealer. While this company's approach to its local situation may not suit the need of every utility, the problem is one which demands attention by every gas merchandising department.

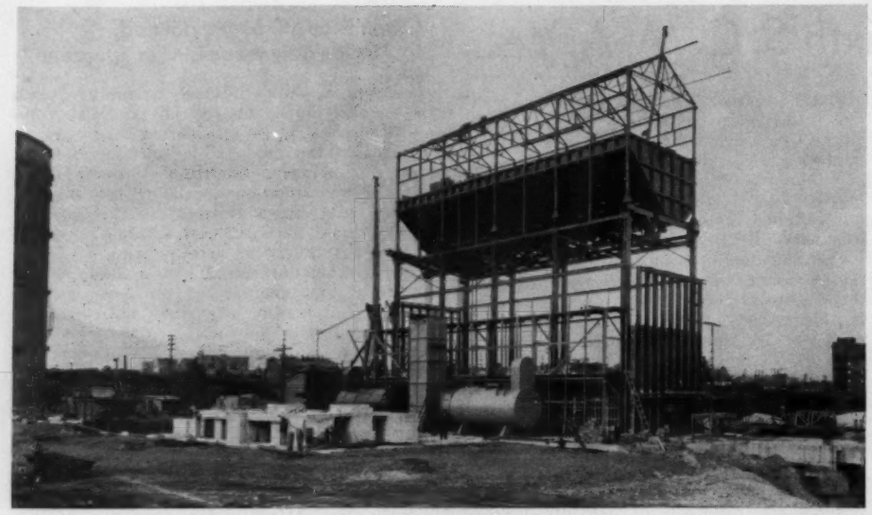
The essentials involved are simply these: The gas company must build load, and this can only be accomplished through large volume sale of appliances. Sales in volume are impossible without liberal terms; therefore the gas company is ready to be as liberal as it can within limits set by good economic practice and the financing opportunities available to dealers in its territory. The situation calls for a careful study of financing services available to local dealers, such as that on which the P. G. and E. schedule was based. Knowing its local situation, the gas company is then in a position to liberalize its own terms intelligently, and to encourage dealers to extend the same sort of term payment inducements.

Reserve Gas Corp. To Operate Kansas Properties of Okla. Natural

Union Gas Corp., Independence, Kan. has leased all of the Kansas properties of the Oklahoma Natural and will operate them under the name of Reserve Gas Corp., a newly formed concern. The Reserve, in addition to holding the lease on the various Oklahoma Natural facilities, has in turn executed an agreement with the receivers of the Union Gas Corp. for the joint operation of the two properties, which are in many places contiguous.

Reserve Gas Corp. is assuming all of the Kansas purchase and sales contracts of the Oklahoma Natural, and arrangements have been worked out so that there will be a complete interconnection and exchange of gas between the two systems.

C. N. Van Slyke, who managed the properties for the Oklahoma Natural, is supervising operations and assisting in completing the final transfers.



Latest construction view of the new gas manufacturing plant of the British Columbia Power & Gas Co., Ltd.

Plant To Be Completed in November

RAPID progress is being noted on the British Columbia Electric Power & Gas Co.'s new coal gas plant, which is now taking shape at the company's old Royal City Mills site, in Vancouver. John Keillor, gas engineer for B. C. Electric, is in charge of operations.

The new plant, which is being supplied by the Gas Chambers & Coke Ovens Ltd. of London, England, will have a daily manufacturing capacity of 3,000,000 cubic feet, consisting of 24 vertical chambers, waste heat boilers, coal bunkers, coke handling, quenching, screening and conveying equipment.

Auxiliary equipment will complete the plant, such as tar extractors, scrubbers, purifiers, naphthalene washers, condensers and exhausters.

It is estimated that the plant will use 30,000 tons of coal a year, consuming 180 tons a day when fully charged, metallurgical coke will be a new by-product of the plant, the only plant of its kind in Canada to produce this fuel.

A special feature of the plant will be the heating of the ovens by producer gas made in outside automatic producers, eliminating the method of heating the retorts by individual hand-fired producers under each bench.

The new plant is being rushed to completion to take care of the winter load of 1932-33, with a continued increase in the demand for gas.

The view above shows steelwork of the chamber oven bench in position. The coal bins are in the upper part of this structure and the ovens will be built up to the underside of these bins. The flues can be seen at the ground level. In front of them are the waste heat boilers with a short length of boiler chimney erected in position. In the foreground are the foundations and heavy concrete bases for the producers and incidental machinery.

The company is now calling for bids for construction of a new coaling wharf. The new wharf will be located on the company's property adjoining the new gas plant, and will be used to receive coal for the gas generating plant and will be fitted with modern coal handling equipment. During the first year it is expected that about 75,000 tons of coal will be handled, to be increased to several times that amount in the next few years.

H. Ray Milner, K.C., Named President of Canadian Western

ANNOUNCEMENT was made in June of the appointment of H. Ray Milner, K. C., Edmonton, Alberta, to fill the post left vacant by the death of C. J. Yorath, president of the Canadian Western Natural Gas, Light, Heat & Power Co., Ltd., of Calgary. Mr. Milner has been chief counsel for the corporation and its operating subsidiaries for several years.

Mr. Milner will have under his direction in addition to Canadian Western the following companies: Northwestern Utilities, Ltd., Edmonton, Gas Production & Transportation, Ltd., Nanaimo Electric Light Heat and Power Co., Nanaimo, B. C., Duncan Utilities, Drumheller Consolidated Collieries, Ltd., Mid-West Utilities Ltd., aid several others. Following his appointment, Mr. Milner announces the following personnel changes throughout his organization:

Julian Garrett, manager of Northwestern Utilities, Ltd., of Edmonton, appointed a director of the Canadian Western Natural Gas, Light, Heat & Power Co. Ltd., of Calgary.

P. D. Mellon, superintendent and chief engineer of the Calgary Gas Co., appointed a director of Northwestern Utilities, Ltd., of Edmonton.

H. S. Tims, of Calgary, appointed financial comptroller of all the operating companies.

E. W. Bowness, manager of the electrical subsidiaries of Dominion Gas & Electric, appointed a director of Northwestern Utilities of Edmonton, Canadian Utilities of Calgary and Union Power Co. of Drumheller.

H. S. Watts, secretary-treasurer and a director of the Calgary Gas Co., will continue in charge of administration of that company, and D. K. Yorath, secretary of Canadian Utilities, will have charge of insurance and statistics of all operating companies.

Electrolux Inventors Receive Medal for Contribution to Science

FRANKLIN Institute of Philadelphia during the annual Medal Day exercises at the institute, May 18, awarded the John Price Wetherill Medal and Certificate to Baltzar Carl von Platen and Carl Georg Munters, inventors of the Electrolux gas refrigerator.

Carl Munters

The John Price Wetherill Medal is given annually as recognition of an outstanding discovery or invention in the physical sciences. The Electrolux inventors were given this medal in recognition of the new refrigeration principle used in their Platen-Munters refrigerating system.

How practical and valuable this particular invention has proven is borne out by the fact there are now over one-quarter million absorption refrigerating systems in service in this country which operate on the principle for which this medal was awarded.

Dallas Gas Co. Installs 163 Refrigerators in Two Apartments

Installation of 163 Electrolux gas refrigerators and 50 gas ranges in Stoneleigh Court and Maple Terrace, apartment hotels in Dallas, early in June was one of the largest single sales of gas equipment handled in the Southwest. The gas ranges going into Maple Terrace replaced electric ranges, and all gas refrigerators replaced electric refrigerators. Gas ranges were already in use in Stoneleigh Court.

Sale of the equipment was the result of eight months of intensive effort by the Dallas Gas Co., and was accomplished by C. K. Patton, commercial manager of the company, and Sam Grasinger, supervisor of sales.

One hundred and eight gas refrigerators were installed in Stoneleigh Court, Dallas, by the Dallas Gas Co.

Installation of the equipment was supervised by W. F. Pearson, superindendent of the Dallas Gas shops, who arranged the work so that the 108 refrigerators for Stoneleigh Court, each of which required special carpentry in placing, were installed in four days by 10 regular workers and one extra carpenter.

BUTANE - PROPANE NEWS
Covering Liquefied Petroleum Gas Service

Butane for Emergency and Peakload Gas —Utilizing the Davis Process

By W. A. FABER
Chief Engineer
General Oil Gas Company, New York

IN order to maintain a high load factor on natural gas pipe lines and thus insure low cost transportation of natural gas the natural gas industry is faced with an urgent need of an efficient process for the production of an emergency or peakload gas of about 1000 B.t.u. and about .65 specific gravity, which can be mixed in any proportion with natural gas. Manufactured peakload gas of 1000 B.t.u. can be produced at a cost of less than the cost of straight natural gas transported at low pipe line load factor.

Butane-air can be satisfactorily adapted to peakload when high specific gravity is not objectionable. Butane is now and will continue to be readily available at reasonable prices and can be stored in liquid form at low cost. Butane itself, as a gas, has a specific gravity of 1.95 and a heat content of 3200 B.t.u. per cubic foot. When the heat content is reduced to 1000 B.t.u. per cubic foot by mixing with air, the resultant specific gravity becomes 1.3. This gravity is too high to permit the introduction of such butane-air gas into appliances adjusted for natural gas having a specific gravity of 0.67. Even when 1000 B.t.u. butane-air gas is thoroughly mixed with natural gas, only 10 per cent or less of such butane-air gas in the mixture would be permissible for good appliance operation.

However, the problem of obtaining low specific gravity with the use of butane for peakload gas has been solved by a new development known as the Davis process for the reforming of hydrocarbon gases.

The Davis Reforming Process has been recently developed by the General Oil Gas Corp., and is being introduced to the industry by Brokaw, Dixon, Garner & McKee Engineering Co., Inc. With the use of this process butane, or any hydrocarbon gas of high heating value and high specific gravity, can be converted to a gas of any desired B.t.u. content within the range of 500-1000 B.t.u. per cubic foot, and any gravity required to meet the specifications of gases distributed by public utilities.

Existing standard water gas equipment can be utilized in connection with the Davis reforming process. Both generator and carburettor can be used independently and interchangeably as separate reforming units, thus doubling the capacity of a water gas set in terms of carburetted water gas volume capacity. The conversion costs are low and the operation is simple and automatically controlled. No solid fuel, such as coal or coke, is employed and the process is carried out with a thermal efficiency of 88-90 per cent.

To attain these results the Davis process utilizes a catalyst composed of pure nickel wire (No. 10 gauge wire coils 1 inch in diameter by 2 inches long) and the reforming process is carried out in a water gas generator or carburettor shell which is filled with the catalyst. The reforming operation consists of three stages of 1 to 2 minutes each, or a total of 3 to 6 minutes per cycle, depending upon the composition of the gas desired, as follows:

Stage 1: Butane vapor is passed through the hot catalyst at an initial temperature of about 1300° F. and is decomposed to any desired B.t.u. between the range of 700-1400 B.t.u. (depending upon the grade of finished gas required). The carbon resulting from such decomposition is retained on the surface of the catalyst. The final temperature at the end of this stage is about 1050° F. The offtake gases leaving the reforming chamber are free from carbon, tar or sulphur, and are passed through a heat exchanger and seal to the existing relief holder.

Stage 2: Hot air is blown through the reforming chamber in contact with the hot carbon deposited on the surface of the catalyst and reacts to convert part (not all) of the carbon into producer gas. The temperature of the catalyst is raised from 1050° to 1450° F.

Stage 3: Steam at low pressure is passed through the catalytic mass and allowed to react with the remaining carbon on the catalyst to form water gas. The temperature is lowered by the reaction from 1450° to 1300° F. and the cycle is repeated.

All of the gases from Stages 1 and 3 are discharged to the relief holder and therein blended. For the production of 1000 B.t.u. finished gas, all blow run gas produced during Stage 2 is purged to the atmosphere. For the production of 500 to 800 B.t.u. gas, part of the blow run gas is blended with the gases in the relief holder. The temperature, rate of flow, and time of cycle, are adjusted to produce the desired heating value of the finished gas in the relief holder.

The main advantages of the Davis gas reforming process, for 1000 B.t.u. peakload gas production, may be summarized as follows:

(1) Specific gravity of the Davis reformed gas meets the required specifications of any type of city gas.

(2) Thermal efficiency of conversion of butane to 1000 B.t.u. gas is 88 per cent as compared with 50-60 per cent with other processes.

(3) Existing water gas equipment can be adapted readily to reforming.

(4) Capacity of existing water gas equipment can be doubled in volume as compared with carburetted water gas output of a given set.

(5) Sulphur: No purification is required, as butane is practically sulphur-free.

(6) Tar or condensate: No tar or condensate is produced; the gases leaving the reformer are free from tar fog.

(7) Carbon: No carbon is carried out of the reformer in a free state. All free carbon is retained on the surface of the catalyst and due to its high reactivity it readily combines with the oxygen of the air or steam during their respective stages of the cycle.

(8) Gum formation: No gum-forming compounds are produced in the finished reformed gas. The content of illuminants (olefins) is lower than any other high B.t.u. manufactured gas.

(9) Steam: Less than 10 pounds of steam at low pressure is required per M.c.f. of finished gas produced.

(10) Compression: The finished gas of 1000 B.t.u. will stand 100 pounds pressure, 15° F., without causing condensation of the higher paraffins present in the reformed gas.

(11) Conversion Cost: Owing to the absence of carbon and sulphur removal, together with the low steam required and the high capacity, the conversion cost per M.c.f. of finished reformed gas is 50 per cent lower than other processes for the production of similar peakload gas.

DAVIS PROCESS REFORMED BUTANE—PHYSICAL AND CHEMICAL CHARACTERISTICS

B.t.u. of Finished Gas	550	800	1000
Specific Gravity	0.62	0.65	0.68
Gas Analyses			
CO_2	5.84	4.70	4.50
Illuminants	1.65	3.15	3.90
O_2	0.10	0.10	0.10
CO	10.11	7.54	7.20
H_2	50.80	54.25	55.70
CH_4	7.60	8.10	8.10
C_2H_6—C_4H_{10}	8.20	14.96	20.20
N_2	15.70	7.20	0.30
	100.00	100.00	100.00
Thermal Conversion Efficiency	88%	89%	88%
Gallons of butane per MCF	6.12	8.82	11.15

SCAIFE
I. C. C. CYLINDERS

A majority of distributors of Liquefied Petroleum Gas now use the Scaife cylinder.

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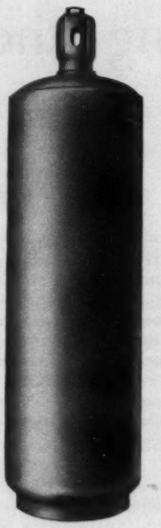

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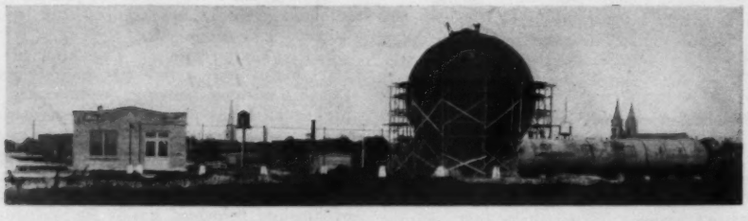
New York Pittsburgh Chicago

Canada's First Butane-Air Plant in Service

CANADA'S first central butane-air plant was placed in operation at Three Rivers, Quebec, late in May by the City Gas & Electric Corp., Ltd., of Montreal. The plant has a capacity of 20,000 cubic feet per hour, with two single-stage straight line gas compressors delivering 10,000 cubic feet of butane-gas per hour. The compressors are driven by 25 h.p. motors. There are two vertical air-butane aftercoolers. Foundations have been provided for two additional compressors and aftercoolers. The plant is also equipped with a butane vaporizer and full automatic control, including a recording calorimeter. The heating value of 460 B.t.u. is automaticially maintained by an industrial carburetor. A butane trap and pressure reducing regulators are also a part of the plant's equipment.



City Gas & Electric Corp.'s new butane-air plant at Three Rivers, Quebec.

J. H. Warren

Butane liquid is stored in a 42 x 10 foot steel tank with a liquid meter gauge. After the gas is mixed, it is stored in a 45-foot diameter high-pressure storage holder. A gas fired boiler produces steam for vaporizing and heating purposes. Commercial butane is supplied by the Carbide & Carbon Chemical Corp., N. Y., whose engineers designed the plant and supervised its completion and initial operation.

The gas is distributed to consumers under 2 pounds pressure, reduced by individual domestic service regulators to 6 to 8 inches water pressure. Two miles of distribution system is now in operation, with further extensions planned, the plant being capable of serving approximately 3,000 consumers.

The office of the City Gas & Electric Corp. Ltd., at Three Rivers is under the managership of J. H. Warren. A display of gas appliances has been set up there and the company plans to enter actively into the merchandising field.

Hutchinson Gas Co. Opens New Office; Personnel Appointed

Hutchinson Gas Co., has opened an office in the Senescall Bldg. on North Main St., Hutchinson, Minn. Chas. W. Johnson has been placed in charge as manager, Emil Luedke is head of the sales division, and Al Rolander is in charge of the service department. John Allen of Minneapolis is general manager of the company, which is a subsidiary of American Gas Construction Co., Minneapolis.

American Gas Construction Co., is constructing a butane plant and distribution system for the Hutchinson Gas Co., and it is reported that 10 other plants are planned for Minnesota suburban territory for the summer months.

Farm and Ranch Natural Gas Co. Formed to Sell Bottled Gas

The Farm and Ranch Natural Gas Co. has been formed to serve bottled gas in the rural districts around San Angelo, Texas, where the company headquarters. Incorporators of the company are H. W. Presseur, formerly with the Texas Public Service Co., Austin; and N. A. James and Guy French. The company plans also to stock a full line of gas appliances.

Lower Rates for Butane Service in Eveleth, Minn.

Northland Utilities, Eveleth, Minn., announced a reduction in its rates effective with the May billing. The minimum monthly billing is now $1.25, and the initial rate is $2 per thousand. The company serves butane gas in Eveleth.

Iowa State Game Farm Raising Game "Chicks" With Bottled Gas

AN interesting application of bottled gas for commercial purposes is reported by the State Game Farm at Lapwai, Idaho. The gas is used in the brooder and incubator houses and is piped from a central plant composed of eight cylinders of gas, four of which are hooked up together. The gas line is connected between the two fours and when one of the units is empty an automatic switch turns on the supply from the other unit. The empty cylinders are then replaced.

The incubator is heated with hot water, the water heater being controlled by a thermostat. Jim Marshall, superintendent of the farm, reports that the first hatch taken off since installing the new equipment, is the best which the farm has ever had.

A three-quarter inch pipe conducts the gas from the supply tanks through the entire length of the six brooder houses, and a one-quarter inch connection drops into each brooder house. Mr. Marshall reports that they have been very successful in the artificial brooding of the Chukar partridge, a native of India, and that present indications are that the season at hand will prove very profitable with the installation of the bottled gas equipment. They are also experimenting on the artificial brooding of pheasants at the farm.

Plans for Butane Plant in Maine

Cumberland County Power and Light Co., Biddeford, Me., recently completed a survey of Sanford and Springvale, Me., for establishing a butane plant. Construction of the proposed plant will not get under way until next year.

P. G. & E. to Buy Franchises

Natural Gas Corp. of California has received permission from the State Railroad Commission to sell, and Pacific Gas and Electric Co., San Francisco, to purchase, the gas franchises in Calistoga and St. Helena, Napa county.

Williams to Manage at Cottage Grove

L. R. Williams has been named manager of the Natural Gas Corp., of Oregon at Cottage Grove, Ore. Mr. Williams was formerly with the Natural Gas Corp. of Calif. at El Centro.

McNay Bottled Gas Distributor

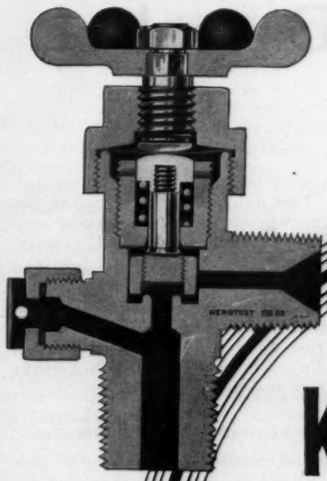
I. N. McNay is selling liquefied petroleum gas in bottled form at Ephrata, Lancaster County, Pa.

Essex, Iowa, Scheduled for Service

Central States Electric Co., Cedar Rapids, Iowa, is reported to be planning construction of a natural gas distribution system in Essex, Iowa, supply to come from the main line of the Natural Gas Co. of America, Chicago, Ill.

Asks Kingsport Franchise

Kingsport Utilities Co., Kingsport, Tenn., has applied for permission to serve natural gas in Kingsport.



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Equipped with triple metal diaphragms insuring long, continued gas service . . . seat inserts and diaphragms readily renewed . . . positively sealed against leakage . . . a valve that has successfully withstood a pressure of 11,250 lbs. per square inch by the Underwriters Laboratories as well as a durability test of 50,000 complete cycles of opening and closing without failure. Write for descriptive literature.

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Office and Factory: Anderson, Indiana

Protection for San Diego Line

(Continued from Page 15)

of the tests made by the United States Bureau of Standards, the American Petroleum Institute and the American Gas Association. These tests as yet cover too short a period of time to make possible the drawing of conclusions concerning all questions that arise during the selection of a coating. However, the great care and skill with which these tests are being conducted, and the lack of other sources of reliable information concerning the comparative value of coatings, make the progress reports of these investigations the most reliable source of information now available. Unfortunately, our decisions regarding the protective coatings to be used could not be deferred for 4 or 5 years until these tests had been completed. Consequently some matters had to be decided on rather incomplete data. The men who have been conducting these tests are, of course, in no way responsible for our decisions as they have carefully pointed out that their data are as yet incomplete, and they themselves have refused to draw conclusions except concerning certain points about which they feel they have conclusive evidence. However, any merit there may be in our selection of coatings is to a considerable extent attributable to the investigations just referred to.

Preference has been given to coal-tars rather than asphalts for several reasons. The principal cost of the electrical protection which we plan to use is the energy cost, and it is therefore highly desirable to use a protective coating with as high an electrical resistance as possible. All of the data that we have, indicate that coal-tar coatings maintain their electrical resistance much better than do asphalt coatings. We also think, though our evidence concerning this point is not complete, that the possibility of the coating deteriorating under the influence of the continuous flow of electric current to which it will be subjected is less in alkaline soils for coal-tar than for asphalts. The comparatively low water absorption characteristics of coal-tar promise that over a long period of time the protective power of these coatings will be better than the asphalt coatings.

There are several reasons for selecting the particular design of coal-tar coating we have specified. The specified coating is particularly adapted to field application. By using two coats of enamel next to the pipe without a reinforcing material between, a thick, dense coating of bitumen is obtained free from pin holes and holidays. The wrapper, since it is not bonded to the second coat, can be applied at any time prior to the laying of the pipe in the trench. Since this wrapper is made of asbestos felt, shown by the tests of the American Gas Association to be unaffected by soils, it is not necessary to use an outer coat of tar to protect the wrapper. The wrapper is in direct contact with the soil and free to move slightly as the soil moves. Applied in this way, the wrapper protects adequately from soil stress and still does not destroy the imperviousness of the second coat of bitumen as it would if it were included between the two coats of bitumen.

Two-hundred-degree-melting-point, coal-tar was selected because it seems to be generally conceded that the higher the melting point the more effective the protection afforded by coal-tars. Some apprehension was at first felt as to our ability to apply a coating with such a high melting point, but in the weather prevailing thus far on the job, the application of this material has proceeded very satisfactorily. The hardness of the coating obtained has proven advantageous during construction, as it prevents mechanical damage.

The pipe is being descaled at the mill and shipped by boat without priming. That stowed in the ship holds is arriving in fairly good condition and can be easily freed from superficial rust by wire brushing. However, pipe carried on deck is arriving with a heavy coating of rust and must be sand blasted.

Electrical Protection Against Soil Corrosion

The electrical methods to be used to protect the San Diego line from soil corrosion are to us the most interesting part of our plans. To our knowledge this is the first time that electrical protection has been included in the plans for a transmission line.

In this connection we wish to acknowledge our indebtedness to R. J. Kuhn, of the New Orleans Public Service Co. and to Starr Thayer and S. A. McGary of the United Gas Public Service Co. These gentlemen have been pioneering in the use of electrical protection for gas transmission lines. It was from them that we got the idea of using such a method on the San Diego line and it is because of their liberality in giving us cost data, etc., obtained from their experiments, that we have felt justified in proceeding on a large scale with the method without having previously experimented with it.†

Laboratory and field tests indicate that if the potential of steel buried in soil is held at from 0.2 to 1.0 volt below the soil potential, all corrosion of the steel will be prevented. The minimum potential required for protection apparently varies with the character of the soil.

The application of this experimentally proven fact to the protection of steel lines underground has been proposed many times. When used as the sole means of protecting bare steel lines, the amount of electrical energy required has been so great that the method has not proven practical. We propose to use the method only where the line has been coated with a protective coating having a high electrical resistance. A flow of current from the soil to the pipe will then occur only where there are imperfections in the protective coating.

The great value of a protective method that will automatically protect all areas where the protective coating fails to protect need not be pointed out to anyone familiar with the maintenance of pipe lines. It seems highly probable to us that by using electrical protection in conjunction with our protective coatings complete protection of the pipe will result. If as time goes on the coatings deteriorate as a result of the mechanical and/or chemical action of the soil, this fact will be evidenced by an increase in the consumption of electrical energy. The time for the reconditioning of the protective coating will be determined by balancing the cost of electrical energy against the reconditioning cost.

The design of the electrical protection installations for the San Diego line are not yet complete and can therefore be described here only in a general way.

Dresser couplings with insulating gaskets are to be installed in each protected section about 40 feet from each end. These insulating joints are not to be installed at the extreme ends of the coated sections because if they were there might be a flow of current from the bare section through the soil and into the coated section that would rapidly corrode the bare section near the insulating joint. All connections to the coated sections are to be carefully insulated from the soil and are to carry insulating joints if they are connected through house piping to other metallic underground systems. Installed in this manner it will be easy to control the potential of the coated sections.

The part of the electrical circuit requiring the most careful designing is the anode through which the current that is drained from the pipe line will be returned to the soil. Since the energy cost will vary directly as the total resistance of the circuit, it is important that the contact resistance between the anode and the soil be kept as low as possible. To accomplish this in soils having a high electrical resistance, requires that the current density at the surface of the anode be low. This fact in some cases may necessitate the use of an anode having considerable area, consisting perhaps of 300 or 400 feet of scrap pipe buried in a trench at a distance of say 300 feet from the pipe line. This anode will of course be consumed by the flow of current and will have to be replaced periodically.

Fortunately the San Diego Line will at many points be within a few hundred feet of the ocean. This will make possible the locating of most of the anodes in salt water lagoons where a relatively low resistance ground can be obtained. Under such circumstances the required area of the anode is relatively small. We are considering the use in such places of a carbon anode similar to the electrodes used in large electric furnaces. Such an electrode would be permanent and would eliminate the expense resulting from the periodic replacement of metallic electrodes.

The direct current required will in most cases be supplied by copper oxide rectifiers taking alternating current from the power company's lines.

The sizes of the power units, the electrical conductors and the anodes required depend in each case upon the amount of current to be handled, which in turn depends upon the electrical resistance of the coating. Until we have had an opportunity to measure the total resistance of the coated sections it will not be possible to design in detail the electrical protection installations.

It appears now that there will be approximately eight (8) sections to which electrical protection will be applied. These sections will vary in length from 4,000 feet to 75,000 feet. Our preliminary calculations indicate that the current that must be handled to protect the longest of these sections (14.2 miles) will at the outset not exceed 5 amperes, and the total resistance of the circuit will not exceed 2 ohms. Based on these two estimates, the estimated power consumption will be 50 watts. Assuming a rectifier efficiency of 20 per cent the A.C. power consumption will then be 250 watts, and the total annual energy consumption will be 2190 kwh. At 5 cents per kwh, the total annual energy cost will be $109.50 or $7.70 per year per mile of pipe protected. Considering the benefits derived, such an energy cost is negligible.

† Testing Pipe Line Coatings in Place, R. J. Kuhn, Oil and Gas Journal, Vol. 30, No. 49, April 21, 1932, p. 47.

United Moves Floresville Offices

United Gas Public Service Co. has moved its Floresville, Texas, offices into the Houston & Green Bldg., with L. F. Martin in charge. The new offices make space available for the display of gas appliances.

"Family Party" of B. C. Electric Draws Record Attendance

A program of entertainment, drama, exhibitions, movies and prizes was planned for the British Columbia Electric Railway Co.'s "family party" on June 1. The show room on Granville St., Vancouver, was thrown open for the event and more than 1,100 non-sales employees and their families attended. The night shift men and their families were entertained in the afternoon, while other employees were invited to the evening events.

Attendance prizes were given, five coupons being handed out at the door and a drawing held at the end of the day. Each department of the company gave individual prizes, the gas department offering a gas space heater and a water heater. The gas department set up a booth in which "hot dogs" were given away free and prospect cards were handed out to those participating in this hospitality. Members of the department were in dinner clothes, dispensing hot dogs cooked by a radiant gas broiler.

While no sales were made during the event, cards were handed out and a discount of 20 per cent was given to employees buying appliances. The large attendance was accounted for partly by the fact that a mailing piece, with the features of the evening attractively advertised, was sent to every employee at his home address.

Texas Railroad Commission to Have Evaluation Section

Formation of the evaluation section of the gas utilities division of the Texas Railroad Commission will be completed in Austin soon, according to Chairman C. V. Terrell.

The new section will undertake valuation of the properties of the gas utilities operating in the state to furnish the basis for charge to be allowed.

The Texas commission expects to reduce the cost of appraisal and valuation work by having its own department do it. Four engineers, four auditors, two stenographers and one bookkeeper are to form its personnel.

Texas Cities Gas Co. Sponsors Cake Baking Contest

Sixty-seven cakes were entered and $31 in cash prizes were awarded in the Texas Cities Gas Co. cake baking contest which was conducted in El Paso early in June. In addition to regular first, second and third prizes of $15, $10, and $5, a special prize of $1 was awarded a 10-year old contestant.

The judges, who were chefs of the three largest El Paso hotels, the director of home economics in the public schools and the county home demonstration agent, worked three hours selecting the prize winning cakes.

New Gas Company Incorporated

The Equitable Gas Co., with headquarters in Roswell, New Mexico, has been incorporated by Sylvester Johnson, Geo. E. French, B. A. Christmas, G. N. Amis, and J. H. Mullis, all of Roswell, with capital stock listed at $100,000.

To Extend Hutsonville Service Area

Hutsonville Gas Co., Hutsonville, Ill., plans to extend its mains and service area immediately, according to statements in the press credited to M. T. Riegle, manager for the company.

Trends in Boiler Design

(Continued from Page 24)

If such a boiler is cross-baffled, having a short furnace and a bridge wall, combustion must be exceedingly quick to prevent a blow-pipe flame impinging upon and burning the tubes. Firing conditions in horizontally-baffled boilers of this type are similar to those found in return-tubular installations. In many cases the baffling must be changed to increase the area of the opening into the second pass if higher loads are expected with gas than with previous fuels.

Semi-vertical boilers similar to the Stirling type should be analyzed individually, because firing methods depend almost entirely on the furnace dimensions, and few of these boilers are set just alike. Early installations were made with the mud drum set 2 or 3 feet above furnace floor level, resulting in a scanty furnace volume. This again requires quick combustion to prevent burning the tubes. As a general rule, at least 2 cubic feet of furnace volume are required per boiler horse power to be developed. This is approximately equivalent to a heat liberation of 25,000 B.t.u. per cubic foot per hour, and this figure cannot generally be exceeded without very quick combustion and a water-cooled furnace. If the furnace is high but short, it may be necessary to fire such boilers from the rear. When this is done, however, a long firing arch under the mud drum is usually necessary in which the radiant heat builds up where it is not available to absorption by the boiler and produces temperatures eventually destructive to the arch. It may be considered better practice to fire from the front, adapting if necessary burners that have wide-spread and quick combustion. Some settings may provide furnaces excessively large, in which case the volume may have to be reduced in the most expedient manner to a point where heat releases between 5,000 and 10,000 B.t.u. per cubic foot per hour may be obtained. If the liberation is much lower, radiant heat transfer will be negligible. In general, if the application is proper, a greater total of heat may be liberated in a given furnace with gas than with fuel oil, because the flame and liberation is diffused more uniformly throughout the entire furnace.

Boiler of Future: The boiler of the near future may be forecast by the test units now being operated. A 2,500 pound pressure, gas-fired test boiler has been installed at Yarnell-Waring Co. A research unit installed at Purdue University for the purpose of exploring the critical pressure region has been operated at 3,700 pounds pressure. Reports on these and other such boilers will probably be forth-coming this year, and will serve to broaden our vision of what is possible in the direction of high pressures.

The eventual steam generator is suggested by a research boiler of patented design which was tested on the west coast last year. This five horsepower unit developed 1400 per cent of rating! Briefly, the design consisted of pipe and tubing arranged in the shape of a letter D. One vertical leg, a 4-inch pipe, was the down-comer; the opposite side—the riser—consisted of 4-inch tubing inside of 5-inch pipe. Steam generated and superheated in the small annular space between the two. The 4-inch tube core was the furnace. Natural gas was fired downward from the top, utilizing the principle of impact surface combustion. Furnace temperatures well over 3,000°F. were attained and the heat liberation was in the magnitude of several million B.t.u. per cubic foot per hour; yet the flue gas temperature at the bottom of the unit 5-feet below the burner—was in the neighborhood of 350°F. An overall efficiency of 90 per cent was approached consistently. Such operation was made possible by extremely high velocities throughout.

The feature of this unit that promises revolutionary designs in the future, however, is its small size and cost per developed horsepower. A steam generator consisting of many such small units or "cells could conceivably fit inside the furnace of a boiler of equal capacity today. In all probability each cell of such a steam generator would be designed for one given operating condition and capacity, and as many cells would cut in or out automatically as would be required to provide for variations in load. Conceivably, such a steam generator might be constructed integrally with the steam turbine; in any event the boiler room as such would probably disappear, for the entire operation would be clean and free from smoke and ashes. Having approached the maximum in operating efficiency, such a boiler would introduce an efficiency of capital never before attained.

And because this boiler would be designed to burn gas fuel, it follows that gas may play the leading role as boiler fuel not so many decades hence. Such is the trend of boiler design.

Texas Celebrates 23rd Year of Natural Gas Service in State

The twenty-third anniversay of the inauguration of natural gas service in Texas was celebrated May 24 at Marshall, Texas, the first town in the state to be served with this fuel. United Gas Public Service Corp., which now serves the city, the Rotary, Kiwanis and Lions' clubs, joined in the celebration. The principal speaker at the program was Walter H. Sedberry, who pioneered the movement which brought natural gas to Marshall.

Moves Nacogdoches Office

United Gas Public Service Co. moved its Nacogdoches, Texas, office into new and more spacious quarters recently.

City of Guthrie Wants to Buy Western Service Corp. Property

The City of Guthrie, Okla., has made an offer of $250,000 to Western Service Corp., Oklahoma City, for the purchase of the company's pipe line into Guthrie from Oklahoma City Field, and the distribution in Guthrie. Western Service Corp. is now in receivership and is liquidating its properties. Cost of the transmission line and distribution system was estimated at nearly $300,000 at the time of construction. Logan Cary, receiver for Western Service, has not accepted the offer.

New Gas Company Formed

The Iowa County Natural Gas Service Co. has opened a branch office in Marengo, Iowa, with R. A. Soults of Williamsburg as manager.

Natural Gas Service in Small Towns

(Continued from Page 26)

view to education in its use. Someone not familiar with small towns can hardly believe the doubt that can exist regarding such a new fuel and a demonstration that it actually will burn is very often a very good practice. Inhabitants in the town are often prone to wait and watch their neighbors before actually deciding to become customers, so that every satisfied customer means more customer possibilities up to the point of customer limit. The amount of main extension which will be run for each new customer is generally set out in the franchise but in the beginning it is better to be more liberal in this policy, and run more main for a customer than the franchise requires. It is also a good idea to run that portion of the customer's service which is owned by him at a bargain price for a limited time to encourage that obstacle being removed in the future solicitation for the business. This doesn't mean an actual loss, as the service can naturally be run cheaper while the construction crew is still in the town. While the system is being constructed the feeling of the average citizen in the town is that "We are getting something new, we are going to get gas" and concentrated effort should be put forth to secure customers. It is the psychological time.

There being few customers with the consequent few dollars in gross, the operating set-up must be on a minimum basis. Usually gas will be extended to a group of towns at the same time, making possible a division of the operating expense. Under this arrangement, all towns in the group would not have local offices. Arrangement can be made in some of the towns so that the local pipe fitter or plumber for a very small amount will handle trouble calls and cut-ins and cut-outs. Meter reading can be handled by the district meter reader and collections handled by an arrangement with the local bank or store. This is just an example of some of the means that may be taken to keep down operating costs.

The plan for merchandising must be worked out to suit the particular condition. In every case, however, whether the merchandise is handled by local merchants or by the distributing company, it is necessary that the company take a decisive lead in the solicitation of new customers and the education of both new and old customers to the advantages in the use of gas.

In the small towns the local and district managers come directly in contact with the customers and from these contacts closer feeling between the individual and the company can be made to exist. It is imperative that advantage be taken of this and the public be acquainted of the sincere efforts to serve, of the problems involved in this service, and of the company interest in the community since becoming one of its permanent citizens and taxpayers. A good local manager is a worth-while asset.

Following through we now have a gas distribution system with customers being served. In the small towns, we are somewhat limited at this time to the sale of gas for commercial heating, and for general household service. We will always be limited in the amount of gas which can be sold to the average small town customer by his limit to pay. His earnings are limited and in our sincere efforts to increase the revenue per customer, we must confront this fact. It does not pay to oversell. This limit of course has not yet been reached as only a few are using the economic limit. The use in the winter where the rates permit sale for heating is very much larger than in the summer and this great increase in the monthly bill, tends more than any other factor to promote ill will and discontent among the customers. If some method could be devised to smooth out the customer's bill over the 12 months period, a considerable amount of complaint could be eliminated. Experience will show that rates are not the cause of complaints as in those towns and cities; where the rates are so low, comparatively, that the customer regulates his house temperature by amount of open window space, rather than by cutting down the fire, you will find complaints as numerous and as severe as in the towns and cities with much higher rates. The customer does not consider his use, he merely considers the comparison. The natural first thought of a way to combat this is in a change in the form of the rate structure and there may be a solution from this source. This is a point worthy of consideration of the management, the commercial and the engineering divisions, and with the conscientious thoughts of all, possible solutions will appear.

In conclusion let it be said that the development in the town involves the same problem as in the city. It involves an expenditure of funds for a service to the public with an idea of a fair return on the investment. The application of thought and effort is to make the investment as small permanently as possible and to increase the revenue as great as can safely be done, as quickly as can be done to secure that yield; keeping ever in mind the public point of view so as to maintain satisfied customers.

G. O. 58 Revised by Calif. Commission

EFFECTIVE July 1, a revision of General Order 58, the basic order under which gas utilities operate in California, has been issued by the California Railroad Commission. The revision introduces a number of changes in the former order, among them being the following:

1. Hydrocarbon gases (liquefied petroleum gases) are brought within the application of the rules.

2. Temperature correction is added to the definition of a cubic foot of gas under some conditions.

3. Modified pressure records are introduced.

4. Statistics listed as station records have been expanded.

5. Cutting of service at the property line or curb is required within 120 days after demolition of buildings.

6. New Requirements are established on calorimeter stations.

7. Provision is made for sale of gas at high pressures.

8. Utilities are permitted to confine pressure surveys to peak periods.

9. Permission is extended for establishment of stations for recording pressures over the distribution system, these station pressures to be accepted for 50 per cent of the charts on low pressure systems. Unit of measure for determining number of charts to be taken is based upon miles of low pressure main instead of total miles of main.

10. On all complaints, taking and recording of pressure is required.

11. The meter change period is established at 7 years instead of the former 6-year period.

12. Requirement is set up for shut-off valves or cocks located outside structures served, and accessible at all time.

13. Simplification is made of the rulings relating to meter deposits.

Canadian Communities Scheduled For Service Extensions; Cost $80,000

Contracts which will give Oak Bay, Esquimalt, and Saanich municipalities the same gas rates as the adjoining city of Victoria have now been drawn up by the Victoria Gas Co., Victoria, B. C., a subsidiary of the British Columbia Electric Railway Co., Ltd., Vancouver. These contracts have been submitted to the municipal councils concerned for their consideration. Extension of mains into the municipalities at a cost estimated at about $80,000 will be commenced following signature of contract by the municipal heads.

Of the $80,000 approximate total expenditure on the new services, the sum of $20,000 will be spent in Saanich; $30,000 in Oak Bay and Esquimalt; and a similar amount for new equipment and pumping apparatus at the generating plant on Government Street, Victoria.

The Sonner Burner Co. Announces Sales Engineering Department

The Sonner Burner Co. has announced the formation of a sales engineering department at the manufacturing plant and foundry at Winfield, Kan.

Walter H. Hoagland, who recently resigned as gas sales supervisor of the Kentucky-Tennessee Light & Power Co., is now in charge of the sales engineering department.

Mr. Hoagland is a member of the Eastern Natural Gas Sales Committee, commercial Section, of the American Gas Association. He begun his first sales work in the gas industry with the Laclede Gas Light Co. of St. Louis, Mo. Since then he has been located in Cleveland with the Barber Gas Burner Co., and in Kentucky with the Associated Gas & Electric System.

Radio Programs by B. C. Electric Are Effective Good-Will Gesture

British Columbia Electric Railway Co., Ltd., Vancouver, B. C., is offering a series of mystery dramas in eight episodes over the radio. The broadcast is given by a professional company of six members and comes over station CNRV, Vancouver, at 9:30 P. M. Last year the company featured grand opera in its radio program of 11 weeks, and this year has already dramatized the "Three Musketeers" and "Bulldog Drummond" for its radio audience. The broadcast features are planned by the company's publicity department under Jas. Lightbody, manager.

Franchise at Ralston, Neb.

Northern Gas and Pipe Line Co. has secured a natural gas franchise at Ralston, Neb., near Omaha.

Gas Cooking School for Business Girls Held Evenings in Vancouver

The British Columbia Electric Power and Gas Co., Ltd., Vancouver, is now running a gas cooking school at night on alternate Tuesdays from 8 until 10:30 under the direction of Miss Agnes Reed, home service director. The class is especially planned for business girls and others so occupied that they are unable to attend day-time classes of the company.

Southern Union Gas Co. Opens Offices at Pyote, Texas

Headquarters for operation of Pyote, McCamey and Monahans properties of the Southern Union Gas Co. have been opened at Pyote, Texas. C. D. Webb is manager of the gas company at McCamey and the gas and water plants of the company at Pyote and Monahans. Harvey Beauchamp, district manager, has offices at Pecos.

Appliance Sales in Brighton, Colo., Average $72 per Customer

The Public Service Co. of Colorado, Denver, began natural gas service in June 1932, in Brighton, Colo. During the ensuing six months, the company signed up 155 gas customers, 18 of whom are on house heating and 21 on commercial service. Gas appliance sales to the 155 customers averaged $72.03 during the period.

Peyton Gas Co. is Formed

Peyton Gas Co., Mexia, Texas, has been given permission to operate in the State of Texas. Incorporaters are named in reports as Wm. Peyton, Geo. L. Peyton, and J. M. Peyton. The company plans to develop gas holdings in the East Texas fields.

Lycoming Natural Gas Co. About Ready to Build 40-Mile Line

Lycoming Natural Gas Co., Pittsburgh, Pa., a subsidiary of Standard Oil Co., of New Jersey, is taking rights-of-way for a 40-mile, 20-inch natural gas transmission line from the company's carrier in Tioga County to the Hebron gas field.

Muskogee Natural Gas Co. Moves Headquarters to Tulsa

Headquarters of Muskogee Natural Gas Co., Muskogee, Okla., have been moved from that city to Tulsa. The Muskokee office will be a district office in charge of Lester Bunch as manager.

Graves Named Manager at La Verne For State Fuel Supply Co.

R. B. Graves has been made office manager in the La Verne, Okla., office of the State Fuel Supply Company, replacing Chas. Webster. Mr. Graves was formerly at Wewoka, Okla.

New Franchise for Fulton Petroleum

Fulton Petroleum Co. was recently granted a new franchise in Grand Junction, Colo., with the provision that service must start within two years.

New Roberts-Gordon Plant

Roberts-Gordon Appliance Corp. opened a new office and plant at Arthur and Tonawanda Sts., Buffalo, N. Y., on June 1, 1932.

Delegates to the Canadian Gas Association's Annual Convention Gathered at Winnipeg, Canada, June 9-10, 1932.

Canadian Gas Assn. Holds 25th Session

HUGH McNAIR, manager gas utility, Winnipeg Electric Co., Winnipeg, Manitoba, was reelected president of the Canadian Gas Association for the year 1932-1933 at the 25th Anniversary Convention of the Association, held at Winnipeg, June 9 and 10, 1932. Elected to serve with Mr. McNair are D. G. Munroe, vice-president and managing director of the Montreal Coke & Manufacturing Co., as president; J. C. Dawson, assistant superintendent gas department, Quebec Power Co., Quebec City, second vice-president; and G. W. Allen, industrial survey engineer, Toronto, secretary treasurer. The executive committee serving for the year 1932-1933 period will consist of Arthur Hewitt, vice-president and general manager, Consumers' Gas Co., Toronto, Ont.; J. S. Norris, vice-president and managing director, Montreal Light Heat & Power Co., Montreal; C. A. Jefferis, works superintendent, Consumers' Gas Co., Toronto, J. M. H. Young, superintendent, City Gas Co., London, Ontario; H. S. Williams, superintendent, gas department, Guelph, Ontario; V. S. McIntyre, manager, Public Utilities Commission, Kitchener, Ontario; Col. D. R. Street, general manager, Ottawa Gas Co., Ottawa, Ontario, and Major J. J. Humphreys, chief engineer gas department, Montreal Light Heat & Power Co., Montreal, Quebec.

The Annual Banquet, held on Thursday, June 9, featured addresses by Hugh McNair, Edward Anderson, K. C., president, Winnipeg Electric Co., Alexander Forward, managing director, and R. M. Conner, director of the Testing Laboratory, American Gas Association, and C. H. Dahl, vice-president in charge of operation, Winnipeg Electric Company.

Time and place for the 1933 convention have not been selected, plans depending largely upon the schedule of a delegation of engineers from England, Scotland and France, expected to arrive in Canada in 1933.

Pipe Line Flow Data in Bureau Report

"FACTORS Influencing Flow of Natural Gas Through High Pressure Transmission Lines" is the title of a report recently published by the United States Department of Commerce, Bureau of Mines, compiled by W. B. Berwald, associate petroleum engineer of the Bureau and T. W. Johnson, associate natural gas engineer of the Bureau, both stationed at the Petroleum Experiment Station at Bartlesville, Okla.

The report covers a study made by the Bureau in cooperation with the Natural Gas Department of the American Gas Association, involving several years research on the problem of the flow of natural gas through high pressure transmission lines. Data on gas flow under many conditions of operation have been analyzed, together with all other available information, to secure practical facts for the use of operators in designing pipe lines and determining the effects of various operating conditions on pipe line capacities.

All existing data were reviewed as a preliminary step and further experimental work done under conditions comparable to those found in transmitting natural gas. The problem included flow tests on pipe lines in operation, and in each test the measured delivery was compared with the delivery calculated from several common pipe line flow formulae. Flow tests were made on 29 pipe lines, totaling 757 miles of pipe in the principal natural gas areas of the country. Diameters of the pipe range from 6 to 22 inches, operating pressures from 30 to 600 pounds. Analysis was made of all factors affecting the flow through each line.

Fundamental data on some of the variable factors influencing the flow of gas were obtained from tests with a small experimental pipe line, where precision of measurement and close regulation of variables was possible. The investigation was primarily an engineering study of pipe lines in the long distance transmission of natural gas and a comparison of the actual observed rates of flow with the results obtained from the application of the various pipe line flow formulae.

The report summarizes conclusions arrived at through these investigations, and is planned as a practical help in designing pipe lines and analyzing the effect of different operating conditions on the efficiences of pipe lines.

Copies may be obtained by addressing the Section of Publications, U. S. Bureau of Mines, Washington, D. C. The report is styled Bureau of Mines Report of Investigations 3153.

Line to Serve Electric Generating Plant in Pluma, S. D.

Montana-Dakota Power Co., Minneapolis, Minn., recently completed a 5-mile line from Central City, S. D., to Pluma, S. D., to serve natural gas to the electric generating plant of the Consolidated Power & Light Co.

Shown on the left is one of the several benches and tables for picnic use at Settle Station Park. At right, the cooling pond at the park which has been drafted into service as a swimming pool.

Compressor Plant Site Used as Picnic Grounds

AN outing and picnic grounds dedicated to use by clubs, churches, fraternal organizations, companies and similar groups has been opened by the Oklahoma Natural Gas Corp., Tulsa, Okla., in Settle Station Park, 15 miles northeast of Tulsa. Use of the grounds is free of charge.

Natural features of the park, which in the winter time is a compressor station, made it adaptable for recreational purposes. Its topography is ideal for the purpose and a natural grove affords shade for picnics.

A cooling pond, 40 by 90 feet, has been converted into a swimming pool. A sand beach was laid and large beach umbrellas were made available. There is also a wading pond for the youngsters.

Long tables and benches and three brick ovens fired with gas, added to the comfort of the guests.

Facilities for games are another feature of the park. There is a plot for baseball, horseshoe pitching and croquet, and swings and seesaws have been erected. Parking space is ample and an electric lighting system has been installed.

A rock garden and fish pond, beautified with shrubs, was added recently.

Occupation Tax Levied on Seattle Utilities

To balance the city budget at Seattle, Wash., the city council has passed an ordinance levying an occupation tax from utilities operating in the city. The ordinance calls for 3 per cent of the gross revenues from sales within the city by Seattle Gas Co., Puget Power and Light Co., and the municipal electric utility. Pacific Telephone and Telegraph Co. is taxed 4 per cent. The tax will come to approximately $66,000 a year for Seattle Gas Co., on the basis of present sales, and the company has filed application with the Department of Public Works to raise its rates sufficiently to offset the tax. Total taxes for the Seattle company by the new tax are raised from 8.73 cents per dollar of gross revenue to 11.73 cents.

Oswego, N. Y., Scheduled for Natural Gas Supply from Tioga

Construction of a 35-mile gas transmission line between Syracuse, and Oswego, N. Y., is well under way by the Niagara Hudson Power Corp., New York. A supply of natural gas will come from the Tioga-Wayne district through a line from the field to Syracuse.

Change over of the Oswego system, operated by the Peoples Gas & Electric Co., a subsidiary, will get under way on completion of the line from Syracuse to Oswego, as will also change over at Fulton, where the system is operated by Fulton Fuel & Light Co., also a subsidiary of Niagara Hudson Power Corp.

Niagara Hudson Power Corp. recently completed a storage gas holder of 6,000,000 cubic feet capacity at Syracuse.

More Line Construction Reported for Northern Gas and Pipe Line

It is reported that Northern Gas and Pipe Line Co., Omaha, Neb., is planning construction of a 16-inch line from Owatonna, Minn., to serve packing plants in South St. Paul. The line would be approximately 60 miles long, and would extend northward from the present terminus of the Mason City-Owatonna line. Press reports state also, that should financing improve during the coming months, the company plans construction of a line early in 1933 from Sioux Falls, S. D. to Worthington, Jackson and other points in Minnesota.

Oklahoma Natural Gas Corp. Adopts New Monogram

A new monogram, symbolizing natural gas service, has been adopted by the Oklahoma Natural Gas Corp., Tulsa, Okla.

The words, "Oklahoma Natural Gas Corporation" are set in a circle, which embodies a burning torch, symbols of a service which is continuous and dependable.

Company Given Permit to Operate

A charter has been issued to the Central Illinois Natural Gas Co., headquartered at Peoria, Ill. The new company is capitalized at $250,000, and plans to develop gas holdings near Alexander, Ill., where it owns six producing wells. Directors named in the charter include L. H., J. H., and C. D. Waibel, of Elmwood; J. H. Strickler, Canton, and C. L. Kelly, of Peoria.

Sioux City to Be Served Mixed Natural and Manufactured Gas

Sioux City & Electric Co., Sioux City, Iowa, is laying a natural gas main through a portion of Sioux City. The new line will supply natural gas to the present gas plant where it will be used for enriching blue gas in place of oil in the carburetted water gas process. The main will also supply natural gas for use under the boilers in the company's electric plant at the Big Sioux Station. This plant is now fired with pulverized coal. The new gas main has its source of supply in Northern Gas and Pipe Line Co.'s 20-inch line. The Sioux City line varies in size from 12 inches to 16 inches, is entirely of cast iron pipe, and will be operated at 30-40 pounds pressure, according to C. T. Williams, assistant general manager of Sioux City Gas & Electric Co.

Northwestern Utilities Plans Expenditures of $118,000

Northwestern Utilities, Ltd., of Edmonton, Alberta, plans to spend approximately $118,000 in developments in its territory within the next few months. Work will include construction of 2 miles of main transmission line, duplicating a portion of the present line, and extending the company's service area to new suburban districts. A new regulator station is also planned for Inglewood. In addition to the transmission line and distribution system improvements, the company plans to spend approximately $80,000 in a drilling program in the Viking and Kinsella fields.

Gas Well Brought in on Boundary Dome, Saskatchewan

A well producing gas in commercial quantities has been placed on production in Saskatchewan, Canada, according to report. The producer, drilled by the Hatch Syndicate of Regina, is located in the Boundary Dome, and is approximately 15 miles north of the Montana line and east of the Saskatchewan-Alberta boundary. No gauge test has been reported.

Peoples Power Co. to Change to Natural at Moline and Rock Island

Peoples Power Co., Moline, Ill., plans to change over its systems at Moline and Rock Island, Ill., to straight natural gas as soon as construction of a short lateral line from the main line of the Natural Gas Pipe Line Co., of America is completed.

Henry C. Cummins Elected to Executive Committee, Standard G. & E.

John J. O'Brien, president, Standard Gas and Electric Co., Chicago, announces that at a meeting of the board of directors of the company on June 14, Henry C. Cummins was elected a member of the executive committee to succeed Halford Erickson, deceased.

New Service Mains for Springfield

Springfield Gas and Electric Co., Springfield, Mo., plans to spend $30,000 in extending its mains and service area during the summer months.

To Sell 1,000 Gas Furnaces

Council Bluffs Gas Co., Council Bluffs, Iowa, is planning a campaign for the sale of 1,000 gas furnaces during the summer months.

RIVER CROSSINGS need Trustworthy Pipe

For the stresses of laying and for the exposures of subsequent use, pipe lines at river crossings need great strength and durability. They must be fortified as much as possible not only against normal, continual exposure but against the occasional violent strains of storms or traffic. And the nature of their service is such that frequent repairs or replacements are not to be thought of.

It is a testimonial to the dependability of NATIONAL Pipe that it has been used in so many of the largest and most difficult river crossings in all parts of the United States. Cases will be cited and information furnished on request. In coping with special difficulties, the fullest cooperation will be given. River crossing projects is another field of usefulness where NATIONAL trustworthiness has established it as—

America's Standard Wrought Pipe

NATIONAL A. P. I.
CASING
DRILL PIPE
TUBING
LINE PIPE
COUPLINGS
and
REFINERY PIPING

US STEEL

NATIONAL TUBE COMPANY · PITTSBURGH, PA.
Subsidiary of United States Steel Corporation

NATIONAL PIPE

Odorization Equipment in Colorado

(Continued from Page 19)

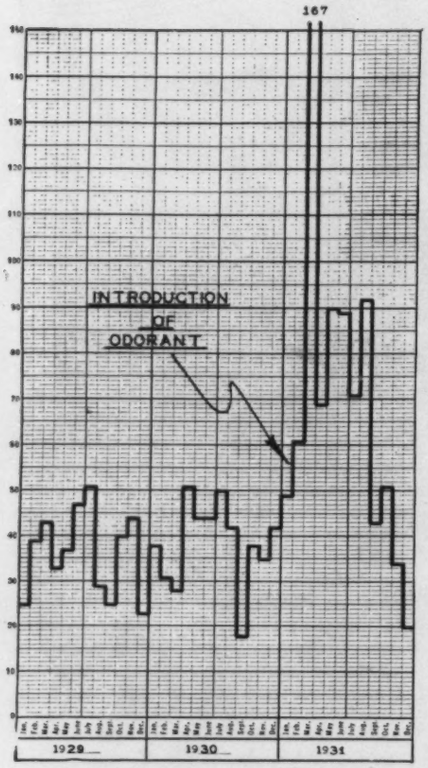


Fig. 3. Leak complaints, Pueblo Gas and Fuel Co., Pueblo, Colo.

the drips along our intermediate pressure lines.

It has been especially gratifying that we have been able to detect numerous cases of main and service leakage. This was beyond our expectations when we started our program of odorization. We have had many reports of leaks from the citizens of Denver who are in no way connected with our company, and in many instances these leaks would have passed unnoticed indefinitely and possibly caused considerable trouble eventually.

Since the first of August, 1931, we have kept a record of this type of main and service leak. During this time 25 street leaks have been reported. A recent analysis of these leaks shows that three were in mains leading to stores and 16 in, or near, residences. One was reported by a plumber, and four noticed by pedestrians on the streets. A typical report reads as follows:

"At Monroe Street and East Thirteenth Avenue, a customer smelled gas when passing by. Main was found leaking, being badly burned by electrolysis; 229 feet were renewed."

A further classification of these leaks showed five were cracked cast iron mains; 15 were services either broken, corroded, or damaged by electrolysis; three were in mains and caused by electrolysis; one was a broken cast iron main; and one was due to a coupling which has not been drawn up snugly.

Experience at Pueblo

Up to the present time, we have had experience with odorants in four properties besides Denver. Fig. 3 shows the results of the introduction of the odorant into the mains of the Pueblo Gas & Fuel Co. at Pueblo, Colorado. This curve gives the number of leaks plotted against months, and is therefore slightly ragged.

We quote the words of the superintendent of the property when asked concerning the benefits derived from the use of an odorant:

"We have found the use of an odorant very beneficial in that it has drawn to our attention, or our customers' attention, a great number of small leaks around stove valves and house piping that otherwise probably would not have been discovered until they had become large enough to be dangerous. To date we have not discovered any really serious leaks inside of buildings.

"We have, however, located several very large leaks in the street by the presence of the odor. One break in an 8-inch cast iron main under pavement was discovered by one of our men who noticed the odor as he walked by the location of the break. At another place, the odor followed a water line from under the pavement to the curb shut-off box and was detected. Several bad joint leaks have been located in the same way.

"The number of leak complaints for the year following the injection of the odorant nearly doubled. We are of the opinion that the injection of an odorant has been of great value to us as a means of detecting leaks which might develop into expense as well as a hazard to life and property."

At one of our properties, we found it necessary to decrease the original amount of odorant injected, and then slowly increase the quantity to a maximum of 3 gallons per million cubic feet in order to handle the complaints as soon as they were reported, without the services of an additional trouble crew.

Probably the best way to express the reactions of the individual properties of the Public Service Co. of Colorado toward the use of an odorant will be to quote from the letters received.

"Odorization has enabled us to locate a serious leak on the service into Montgomery Ward's store. The service was badly rusted under the pavement and enough gas followed the service pipe into the basement to have this leak brought to our attention. We believe that odorization is one of the finest things we yet have done along safety lines.

"We have located, by the use of an odorant, some very large leaks where the results might have been very serious. For instance, a student connected a room heater with a piece of split pipe and then went to school. Later in the day we received a call from the landlady, and on our arrival found the house filled with gas. Main and service leaks have been reported to us by pedestrians. We feel that money used in odorization is wisely spent, and probably has been returned to us in the saving on gas leaks in this distribution system alone."

Perhaps the best summation of the results of our odorization was expressed recently by Mr. Geo. Wehrle, Superintendent of the Gas Department of Public Service Company of Colorado, when he said, "We do not believe properly odorized gas will show up every leak in a distribution system any more than the old manufactured gas did, but we are convinced it will show up any leak that manufactured gas would. The use of odorized gas will not remove the necesesity for proper leakage inspection or prevention work, but it will be of great assistance, particularly in the curtailment of damage caused by gas leakage."

Lone Star Rate Hearing is Scheduled to Begin July 11

A hearing to determine whether city gas rates in the Texas system of the Lone Star Gas Co. of Dallas are fair and equitable has been set for July 11 by the State Railroad Commission. The hearing will require from four to seven weeks, according to C. V. Terrell, chairman. Six volumes of figures, representing the valuation of the Lone Star Co. recently completed by auditors and engineers will be the basis for the city gas rate determinations.

Representatives of various Texas cities from which gas rate disputes have been appealed to the commission probably will be asked to appear at the Lone Star hearing and aid in developing the case.

Replacement value of the Lone Star system was computed at $47,000,000 in the report filed with the commission. This figure, however, did not include Lone Star properties located in Oklahoma.

The replacement value carried on the books of the company is $72,000,000. This principal point of difference between the commission's valuation and the company's figure is expected to be the rate and amount of depreciation.

Valuation of the United Gas Co. properties, similar to that recently completed on the Lone Star system, will be made for the same purpose, Laten Stanberry, head of the gas utilities division of the State Railroad Commission, has announced. The United Gas valuation will be made by the utilities division staff, instead of by private auditing and valuating companies. The company headquarters in Houston and has about 2,000 miles of line in Texas.

Chester O. Dunten Named President and Director of Oklahoma Utility

Effective June 1 Chester O. Dunten succeeds S. E. Wolff as president and director of the Oklahoma Power & Water Co., Sand Springs, Okla. Mr. Wolff has been with the company since January, 1928. Many improvements to the property and much expansion of its business have marked Mr. Wolff's management. He is a director in the Oklahoma Utilities Association. He has made no announcement as to his future plans. Mr. Dunten is a Purdue graduate and has had an active business career of 25 years, going to Oklahoma from Illinois and Indiana.

Gain in Net Earnings Reported By Northern States Power Co.

Net earnings by Northern States Power Co. of Minneapolis, Minn., and subsidiaries for the 12 months ended March 31, 1932, were $17,498,121, or an increase of 4.98 per cent, as compared with the previous 12 months, net earnings for which were $16,666,895. Gross earnings increased 1.44 per cent.

Two New Fisher Representatives

Fisher Governor Co., Marshalltown, Iowa, announces that two new representatives have been named to handle the company's line of specialties in the central west. Grinnell Co., of Minneapolis, Minn., will stock the Fisher line, as will also the Steam Plant Equipment Co., Milwaukee, Wis.

Gets 25-Year Franchise

Western Distributing Co. has been granted a 25-year franchise in El Dorado, Kansas. Two months ago the town voted down a $200,000 bond for municipal ownership.

Here's the new way to add profitable MCFs to your load–

A tiny gas flame makes constant, steady cold.

ONE OF THE SEVEN *new Electrolux Ice Cream Cabinets, equipped with the same revolutionary chilling unitthat has made Electrolux domestic models the choice for over a quarter of a million fine homes and apartments.*

ELECTROLUX

Ice Cream Cabinets!

ALREADY Electrolux domestic refrigerators have increased gas consumption in over a quarter of a million homes. Now the new line of Electrolux Ice Cream Cabinets provides the means of profitably boosting your *commercial* load!

Electrolux Ice Cream Cabinets are *not* just another line of cabinets. They are a sensational development in the ice cream industry. Because Electrolux Ice Cream Cabinets are the *only* cabinets on the market that operate WITHOUT MACHINERY.

Not only do Electrolux Ice Cream Cabinets give manufacturers and retailers all the advantages they *naturally* expect from automatic refrigeration. In addition, Electrolux cuts their maintenance costs 'way down. With no machinery, there's little about Electrolux Ice Cream Cabinets to get out of order . . . cause trouble . . . require servicing.

This year, plan to incorporate this new line in your Electrolux sales effort. Electrolux Ice Cream Cabinets will prove a valuable ally in increasing profits—boosting your load! For complete information, write Electrolux Refrigerator Sales, Inc., Evansville, Indiana.

Uniform Heating Bills Hold the Load

By WALTER H. HOAGLAND
Manager, Sales Engineering Department
Sonner Burner Company, Winfield, Kansas

THE life of the house heating manager is usually fairly peaceful from April until October. During these months he has been actively selling house heating service, but with the approaching heating season, if he has weathered more than one year of gas house heating, he knows that his worries will soon begin again as he tries to keep the jobs sold during the heating season that he actually did sell during the summer months. This is a problem foremost in the mind of gas company house heating managers getting their house heating consumers past the first heating season without having any unusual complaints or having to remove any installations.

W. H. Hoagland

There are justifiable reasons for having this problem. The salesmen cannot hinder the closing of their sales by stressing too much, that the customer's heaviest bills will probably be in the months of December and January. This existing weakness in sales procedure may tend to prove a handicap in holding a sale during the heating season, by the salesman actually avoiding discussion of the probable amount of high bills, when closing the sale. It is human nature, when a customer gets a high bill, to multiply this figure by seven or eight months, depending on location, and thereby arrive at what he thinks will be his season's gas bill. There is another obstacle that the gas house heating manager has to surmount in keeping his job sold during the heating season. Most house heating equipment is purchased on time payment. When the customer receives his December and January bills, to which are added his usual merchandise bill, the total amount not only seems high—it is high. In most cases, this total figure of the merchandise and the fuel for house heating, fuel for cooking and sometimes fuel for hot water, are all grouped together in the customer's mind as a house heating cost. It frightens him as it would most any gas man and presents a real problem in sales resistance. Having battled with these conditions in all parts of the country for several years, it seems that the following might aid materially in increasing the sales market and possibilities of automatic gas house heating during the coming heating season.

If a house heating survey approximates the sum of say $120, why not divide this figure evenly over 12 consecutive months? Let us assume that we have sold a house heating installation for $240; that the fuel costs have been conservatively estimated at $120 a year, and that the customer decides to pay for his house heating equipment in 12 months. He will pay $20 per month, plus the customary carrying charge. If we will collect from him $10 a month for his fuel costs, by adding this cost to his merchandise account, he will pay the gas company $30, plus a small carrying charge, for 12 months.

Of course, the gas company has a contract with the consumer wherein it is distinctly understood that if he doesn't consume $120 worth of fuel, he will be reimbursed for the fuel he did not use. Likewise, if the consumer uses more than $120 worth of fuel, he will pay the gas company, *at the end of his yearly contract,* the difference between $120 and the total amount of the fuel he has already used. This statement should not cause unusual alarm because it is now an established fact based on actual performances over years of successful gas heating, that reasonably accurate estimates can be figured all over the country. This plan enables the customer to buy his house heating service, which is highly seasonable, in the same manner as he would buy a home, a radio or an automobile. It eliminates the high bill cost complaint during the extreme winter months. It eliminates that uncertainty that shrouds every gas house heating sale as to just what the winter gas bills will be month by month. It will reduce the number of jobs removed on account of the cost of operation to a minimum. It is realized that this plan may not work in every locality. Some territories have a short heating season. In such territories, even an eight- or six-months' period could be worked out successfully, in either case keeping the monthly fuel costs uniform until the close of the heating season and then adjusting them according to the actual fuel consumed.

We all know that if we can get our customer to try gas heating for a full heating season, to learn of its advantages under all conditions of weather and temperature, it is much easier then to keep it sold. It does not mean necessarily that a separate gas meter must be installed. Most house heating customers are users of gas for cooking and hot water. From previous records, actual amounts can be allowed for each respective month in arriving at the gross bill at the end of a year's use of fuel, to satisfactorily close the house heating fuel contract. The house heating manager's problem is to keep his job sold through December, January and February. Some such plan as that outlined above should increase the sale of automatic house heating very materially by gas companies adopting it.

Ask Ancillary Receiver for Republic Gas Corp.

A petition asking that Federal Judge T. M. Kennerly appoint an ancillary receiver for the Republic Gas Corp., a holding company chartered in Delaware, was filed in Houston late in May by the law firm of Campbell, Myer, Foster and Myer on behalf of Doris L. Charling of Brooklyn, N. Y. Total assets of the corporation amount to $38,000,000, according to the petition.

Three Part Rates Charged in Carthage, Carterville and Webb City to Stand

The cities of Carthage, Carterville and Webb City, Mo., early in June lost their suits to rescind the three-part rate charged by the Gas Service Co. subsidiaries in those towns, when Judge Harvey Davis handed down a decision that the rates approved by the Missouri Utilities Commission would stand. The cities had asked restoration of the flat rates previously charged. The Judge found that there was no evidence that the new rates provided were unjust, unreasonable or unlawful.

Two suits had been filed against the state utilities commission, one jointly by Webb City and Carterville, and one by the city of Carthage. Each suit asked that a three-part rate be set aside, contending that the rate was unfair and unjust, and was arbitrarily kept in effect by the Missouri Utilities Commission.

Cooking School Conducted Under P. T. A. Endorsement

An educational gas cooking school was conducted for three consecutive days, beginning June 8, by the Seattle Gas Co., in cooperation with the Parent Teachers' Association in the Lincoln High School District. The gas company paid the Parent Teachers' Association at the rate of 5 cents per person attending the school, the funds going into the association's milk fund. Door prizes were supplied by manufacturers whose products were represented in the demonstrations. Arrangements for the school were under the direction of Fred Foy, assistant general manager for the Seattle Gas Co., and the school was conducted by Mrs. Beatrice Strege and Mrs. Ruth Hopkins, home economists for the company.

Warfield Gas Co. Donates Farm for Ashland's Unemployed

The Warfield Gas Co., Ashland, Ky., has donated a farm owned by the company to a relief organization as a community gardening project. The local Red Cross chapter and the Warfield Natural are supplying seeds and potatoes for planting. A large part of the farm will be divided into truck patches and allotted to worthy unemployed.

Ozona, Texas, May be Served from Wells Near Town

Bringing of natural gas to Ozona, Texas, by utilizing a gas well on the Massie ranch 13 miles from the town is a likely possibility. Clyde Bradford, manager of the gas company at Grand Falls, Texas, has been conferring with citizens with a view of establishing local distribution.

Santa Maria Gas Co. To Complete 21-Mile Line by September

Completion of the new 21-mile, 8-inch line between Santa Maria and San Luis Obispo is scheduled for about September 1 by Santa Maria Gas Co. Cost of the line is estimated by company engineers at $200,000. Operations began on June 1, with the delivery of a shipment of pipe via the Panama Canal.

Perkins and Associates Now Serving Natural to Havre, Mont.

A. H. Perkins and associates, recently completed a gas line from the Box Elder structure to Havre, Mont., giving the town a dual supply of natural gas. Under an agreement with Mr. Perkins, one-third of the gas used in Havre will be purchased from his company. Montana Gas Corp., operating a line from the Bowes structure, will supply two-thirds of the town's demand.

Miller to Represent Central States Power & Light as Contact Man

Ira Miller, Elk City, Okla., has been appointed contact man for the Central States Power & Light Co., Oklahoma City. His district will embrace 12 to 15 cities.

How to hold *(and increase)* your heavy duty cooking load

No. 3764
Deep Fat Fryer

No. 3761
Insulated Bake Oven

No. 3758
Radiant Surface Broiler

WHAT must you do to hold and increase your heavy duty cooking load? There is but one answer . . . to replace obsolete equipment with the latest gas cooking equipment that proves the superiority of gas as a cooking fuel.

To interest prospects in these times you must show them that gas cuts cooking costs and improves service. Vulcan provides you with some "brass tack" points that should interest any prospect:

1. Heat losses and gas consumption in oven cooking are reduced by heavily insulated oven walls.
2. Overheated ovens and resultant food shrinkage and waste of gas are prevented by oven heat control.
3. Oven heat is used more effectively in baking and roasting by improved flue system.
4. Top cooking is made more efficient by All-Hot-Top. Heat of one burner spreads under entire top. All rings of burner heat top quickly; then one ring keeps it hot economically.
5. Labor costs are reduced because equipment requires less watching due to automatic control . . . smooth front is kept clean with less work. More comfortable working conditions increase efficiency of help.
6. Insulated, heat controlled deep fat fryer cuts fat costs 25% or more, and assures better fried food.
7. Insulated, heat controlled bake oven assures uniform results every time with lower fuel consumption.
8. Radiant broiler cuts fuel costs, speeds up service and gives a superior quality of broiled food.

Assign one or more men to consistently check up every heavy duty cooking installation on your mains. You will find many opportunities to replace obsolete equipment and hold and increase your cooking load.

Ask for copy of the new Vulcan catalog containing data on the most complete line of heavy duty cooking equipment ever offered.

VULCAN

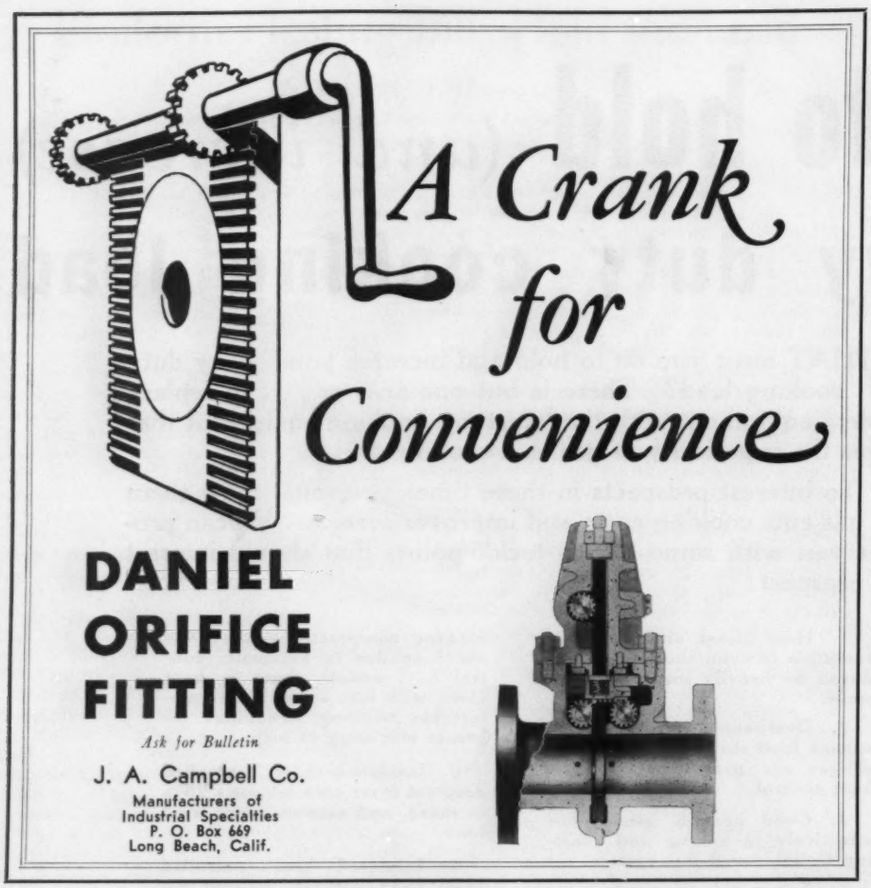
VULCAN EQUIPMENT MAKES GAS THE MODERN EFFICIENCY FUEL—CLEAN, FAST, ECONOMICAL

STANDARD GAS EQUIPMENT CORPORATION
20 East 41st Street, New York City

New York . Philadelphia . Baltimore . Chicago . Boston . Birmingham

Pacific Coast Distributor:
Northwest Gas & Electric Equipment Co., Portland, Oregon

No. 4751
All-Hot-Top Range



Savoy, Inc., Announces New Radiant Gas Broiler to the Trade

SAVORY, INC., manufacturer of the Savory radiant gas toaster, announces the addition of a new Savory radiant gas broiler to its line. The device broils food vertically and on both sides at the same time. The food to be broiled is placed on the grid; the handle is then pulled down,

clamping the food between the grids, which adjust themselves automatically to the thickness of the food. The handle also lowers the grid into the broiler and turns on the gas. When the food is broiled, the handle is lifted, raising the grids out of the broiler and separating them. Space to heat the serving plate is provided under the broiler. The heat is regulated automatically by the thickness of the food being broiled. The new appliance is supplied in black and ivory porcelain enamel.

Employee-Customer Relations Course Brought to Successful Close

A prize speaking contest marked the close of the Employee-Customer Relations courses in the Fort Worth Division of the Lone Star Gas Co., June 8.

A representative of each of the four classes was selected to give a short talk under the subject "What the Employee-Customer Relations Course Has Meant to Me." First prize of $5 was won by Leonard Dickinson and second prize of $3 was won by Miss Mildred Grant.

W. F. Wright, manager, was general chairman of the meeting and E. C. Whitcomb, new business manager, outlined the method by which classes were conducted. Will C. Grant, advertising manager of the Lone Star System, conducted the contest, and the meeting was closed with talks by Henry C. Morris, chief operating executive of the company, and by L. B. Denning, president of the Lone Star Gas Corp.

This company, under the direction of Wesley F. Wright, manager, and Eugene Whitcomb, new business manager, conducted four classes with a total membership of 100, using the A. G. A. Employee-Customer Relations course.

To Decide Guthrie Gas Service Co. Franchise on September 20

The second election in Guthrie, Okla., to determine whether Guthrie Gas Service Co. will continue business in that city for 25 years will be held September 20. The company recently filed petitions with 1,855 signatures asking an election. The names, verified by the city clerk, are more than three times the required total.

The Guthrie Gas Service Company is now charging 43 cents per M.c.f. Under the proposed franchise the company offers a 38 cent rate.

British Gas Engineers to Visit U. S. and Canada in 1933

A group of British gas executives and engineers will visit the United States and Canada in 1933 for a tour of the two countries and to attend the annual convention of the American Gas Association. This announcement was made in June by R. W. Gallagher, president of the latter organization, who, with Hugh McNair, of Winnipeg, president of the Canadian Gas Association, extended an invitation to the British to visit America.

J. R. W. Alexander, secretary of the British Institution of Gas Engineers, has advised American Gas Association headquarters in New York that the council of his organization, in accepting the invitation, plans to be here in September and October, 1933, with numerous gas men from England, Scotland, Ireland and from the Continent.

Lower Gas Rates in Hardin, Mont., Are Announced

The Big Horn Oil & Gas Development Co., Hardin, Mont., recently announced a reduction in rates charged for natural gas service. The initial rate of 50 cents per M. for the first 100,000 cubic feet was changed to 50 cents per M. for the first 6,000 cubic feet. The next 44,000 cubic feet will be billed at the rate of 42 cents per M.c.f., and the next 50,000 cubic feet will sell for 40 cents per M. The reduction amounts to 17.07 per cent in the old rate.

"Gascozette" New Bulletin for Employees at Seattle

Issues of an attractive mimeographed employees' bulletin, by the name of "Gascozette," are now coming twice each month to the Seattle Gas Co. family. The "Gascozette" is published entirely by employees and for employees, and its informal tone should give it an interested following. Ada Card is editor-in-chief.

Northwestern Utilities, Ltd. to Odorize Edmonton Gas Supply

Northwestern Utilities, Ltd., Edmonton, Alberta, will odorize the Edmonton system immediately, equipment having been shipped the middle of June by Pacific Pipe & Supply Co., Los Angeles, with capacity to odorize 5,000,000 cubic feet of gas daily.

W. F. Taylor & Co. Gets Franchise

W. F. Taylor & Co., Dallas, Texas, has been granted a franchise for the service of natural gas in Atlanta, Texas. The franchise provides that service must begin within a year.

Building Compressor at Longview

United Gas Public Service Co., Houston, Texas, is constructing a compressor station at Longview, Texas. The new plant will consist of four units of 165 h.p. each.

ADVERTISING *to Sell* Gas Heating APPLIANCES This Summer

YOU?
You may not need heat now
But, YOU Can Save Money
Today's Greatest Bargains
are Gas Heating Equipment
Special JULY OFFER
Small First Payment—then nothing more until Oct. 1st
A Straight Line to Comfort
GAS HEAT will maintain this Comfort Zone at low cost
SEE YOUR DEALER OR THE
P·G·and E·
PACIFIC GAS AND ELECTRIC COMPANY
Owned · Operated · Managed by Californians

A small down payment does it!*
Get Summer Low Price Estimate
on Gas Heating Appliances
INSTALL GAS HEAT NOW
*and pay nothing more until Oct. 1st
GAS HEAT will maintain this Comfort Zone at low cost
SEE YOUR HEATING DEALER OR THE
P·G·and E·
PACIFIC GAS AND ELECTRIC COMPANY
Owned · Operated · Managed by Californians

Features of the SPECIAL SUMMER OFFER* on gas heating appliances

1. Small down payment—minimum 10 per cent.
2. Special prices—to be the equivalent of a 10% discount (maximum) on small gas heating appliances, and a 5% discount (maximum) on central heating equipment. Discount in either case applies to total of retail price of equipment and cost of installation.
3. No trade in allowances.
4. Deferred payments—first installment to be paid October 1, 1932.
5. Maximum of 12 months to pay when total of sale and installation is less than $200.
6. Maximum of 18 months to pay when total of sale and installation is more than $200.
7. Adequate carrying charges.

(*Adopted at a meeting of manufacturers, their representatives and dealers, and this Company.)

TO SELL gas heating appliances during summer months is easily possible, as was demonstrated by the industry campaign last year.

Manufacturers, their representatives and dealers, and this Company, have adopted, again, a special sales plan for gas heating appliances during summer months.

Pacific Gas and Electric Company is supporting this industry activity with newspaper advertising, outdoor posters, truck banners, bill stickers, window displays, and other publicity. The July newspaper advertisements, inviting prospects to visit dealers' stores, are reproduced on this page.

More than a few dealers have found that tie-in advertising answers the prospects' questions as to *which* dealer he shall see and *where* the dealer is located. If you wish to tie in with the advertisements shown here, call your local newspaper office and find out WHEN they are to be published. Then write, or ask the publisher to assist you in writing, a tie-in advertisement that will lead prospects to *your* store.

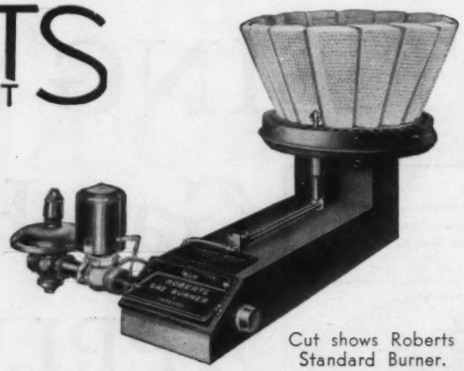
PACIFIC GAS AND ELECTRIC COMPANY
P·G·and E·
Owned · Operated · Managed
by Californians

WG-207-732

ROBERTS CONTROLLED GAS HEATING UNIT

ROBERTS-GORDON offers a complete line of conversion burners for heating the smallest home or largest commercial building.

ROBERTS-GORDON APPLIANCE CORPORATION
BUFFALO, N. Y.



Cut shows Roberts Standard Burner.

NO-OX-ID IRON-RUST
The Original Rust Preventive

IN GAS PURIFIERS

Report of a Competitive Four-Way Test:

Dearborn Representative Dan Delaney of Cincinnati—

"This company has three purifiers 40 ft. in diameter and 12 ft. high for eliminating the impurities from the gas.

"The purifiers are pitting and corroding badly. Last September they coated four strips about four feet wide in one of them—one strip with red lead one with ———, one with an anti-rust paint guaranteed to prevent rust, and one with NO-OX-ID.

"Last Friday morning they opened the purifier and could not find a trace of first three materials, while the NO-OX-ID was as perfect as the day it was applied. Asked me to rush two drums of NO-OX-ID 'A Special' and are coating the entire interior. The other two purifiers will be treated in a similar manner very soon."

* * * * * * * * *

Again the value of NO-OX-ID is proven in this service! We are proud of such reports and like to pass them on to you. Material for tests, recommendations and estimates supplied gladly.

DEARBORN CHEMICAL COMPANY
LOS ANGELES:
807 Mateo Street, Phone TRinity 3385
SAN FRANCISCO
421 Bryant St., Phone SUtter 8688

"Antileke"

The hypo-sealed pipe joint saves 20% to 50% in laying cast iron or steel pipe and repairing any ordinary or difficult gas leaks.

Thousands in use without a single failure.

GAS & ELECTRIC FACILITIES, LTD.
447 Sutter St., San Francisco

Send literature and prices on "Antileke"

Name.....

Address.....

City.....State.....

GENERAL CERAMICS COMPANY
71 West 35 Street, New York, N. Y.
REFRACTORIES FOR GAS APPLIANCES

Genceraco Refractories are made in all shapes and sizes, in color, decorated or plain and in any quantity. They may be had in dense as well as porous material. Extremely resistant to thermal shock and are physically strong. We will gladly send you a quotation on your requirements.

Oklahoma Court Backs Commission's Order to Equalize Gas Takings

The Oklahoma supreme court June 14, held that the corporation commission could go around contracts and compel one gas company to take enough natural gas from producers to equalize takings from the entire pool, even though each of two companies had specific contracts at definite rates.

The court by unanimous action upheld an order of the corporation commission compelling the Empire Gas & Fuel Co. to hook on to wells in Creek county in which the Oklahoma Natural had already hooked on to equalize takings from the common pool so that all producers would benefit alike from the two contracts.

Accident Prevention Manual by American Petroleum Institute

The American Petroleum Institute, 250 Park Avenue, New York, has brought from the press an Accident Prevention Manual on Gas and Electric Cutting and Welding. The pamphlet contains chapters on Accident Hazards, Gas Welding, Regulations for Welding, Burning and Hot Work, Fire Extinguishing Equipment, Tanks, Stills, Towers, etc., and makes the announcement that manuals on tank cars are now in the course of preparation.

Chicago World's Fair Buildings to Be Heated With Natural Gas

The buildings of the Chicago Exposition where the Worlds Fair will be held in 1933 will be heated with natural gas from the Panhandle field in Texas, according to recent announcement. During the Exposition held in 1893 the buildings were heated with oil, attracting wide attention to the use of petroleum as a fuel.

W. T. McNally Named Manager of Natural Gas Utilities

W. J. McNally has been appointed manager of Natural Gas Utilities, headquartered in Collinsville, Okla. The company is a subsidiary of Central States Edison Co., Chicago, and supplies Skiatook, Sperry and Collinsville. Sedan Gas Co., Sedan, Kan., is also a subsidiary of Natural Gas Utilities.

Community Natural to Buy Brownwood, Texas, Gas System

At the recent election held in Brownwood, Texas, J. F. Smith, president of the North Brownwood Gas Co. was authorized to sell natural gas distribution system in that town to the Community Natural Gas Co.

Booneville, Ind. to Be Served July 1

Natural gas service was expected to begin about July 1 at Booneville, Ind., by the Indiana-Kentucky Natural as Corp., Owensboro, Ky. Supply will come from a line of the Missouri Kansas Pipe Line Co.

Clarion Municipal Light Co. Gets Franchise at Clarion, Iowa

The city of Clarion, Iowa, voted recently to give the Clarion Municipal Light Co. a gas franchise. No date for beginning service announced.

Prove New Kentucky Area

The Central Fuel and Gas Co., Cincinnati, Ohio, recently brought in an 8,000,000 cubic foot well near Owenton, Ky., proving a new territory.

Why the WELSBACH HOTZONE *IS KING!*

Quotation from sales plan book of a progressive Utility Co.

"Down through years of experience we have come to look on the Hotzone as the ideal Automatic Gas Water Heater, from the customer's standpoint as well as our own. We have thoroughly combed the manufacturing field, secured data of all kinds, made conclusive tests and, from the angle of good sales merchandise, as well as efficiency in operation, the Hotzone stands in the front ranks. It is a pleasure indeed to say that the HOTZONE will again top our line and be "KING" of this campaign."

SELF ACTION STORAGE GAS WATER HEATERS

Equipped with
Welsbach Multiduty Control
Welsbach Automatic Burner
Welsbach Pressure Relief Valve

Insures

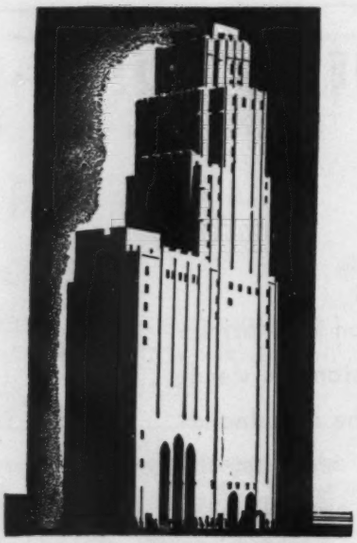
ECONOMY of Operation
Freedom From SERVICE
Complete SAFETY Equipped

MAY WE EXPLAIN?

50 Hawthorne Street
San Francisco

Welsbach
COMPANY
Gloucester City, N. J.

226 So. Wabash Ave.
Chicago



William Taylor Hotel
Most Distinctive Hotel of San Francisco

Also operating
HOTEL WHITCOMB
at CIVIC CENTER

WOODS-DRURY CO., *Operators*
JAMES WOODS *President* — ERNEST DRURY *Manager*

WILLIAM TAYLOR
HOTEL *at Civic Center*
SAN FRANCISCO

DESPITE the swift acceptance of the new U. S. Anthony Joint Pipe for medium and high pressures, the future use of bell-and-spigot pipe for certain distribution requirements is assured by its past record. In Baltimore, bell-and-spigot cast iron pipe laid nearly a century ago is still in service. This Company will not relax its efforts to improve design and quality of the various types of pipe, joints and fittings that have proved their worth to the gas industry.

U. S.
Cast Iron Pipe

United States Pipe and Foundry Co., Burlington, N. J. Sales Offices: New York, Buffalo, Cleveland, Chicago, Philadelphia, Pittsburgh, Dallas, Birmingham, Kansas City, Minneapolis, Seattle, Los Angeles, San Francisco

One of 20 A.G.A. approved products — including floor furnaces, basement furnaces and console heaters

Manufactured by

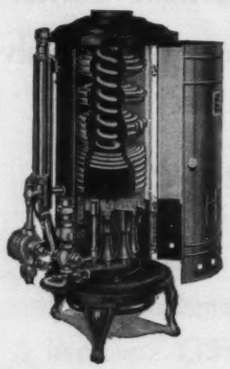
Fraser Furnace Company

Stockton, Calif.

Distributed by

H. R. BASFORD CO. San Francisco Los Angeles

HOFFMAN



Our unbeatable combination of High Quality and Low Price means extra dollars for you. Write us today.

THE HOFFMAN HEATER COMPANY

1701 Dixie Highway
Louisville, Kentucky

Forney Announces Type BL Gas Burner for 2—8 oz. Pressure

Forney Combustion Engineering Co., Dallas, Texas, recently announced the new Type BL Forney gas burner. The burner is made for a gas pressure of two to eight ounces. The head is of heat resisting alloy and is supplied in a number of orifice sizes to give the particular rating desired with the gas pressure available. Six different

The new type B. L. Forney Gas burner, louvre end.

sizes, carrying in capacity from 2.5 to 300 boiler h.p. are made. In the majority of instances, the new burner may be placed in present openings without alterations of the boiler front. The burner is equipped with an air shutter of the louvre type for control of the air for combustion. The louvre may be operated with automatic control equipment.

Amarillo Helium Plant Now Can Produce 36,000,000 c. f. Yearly

The enlarged helium plant operated by the United States Government at Amarillo, Texas, is now capable of producing 36,000,000 cubic feet of helium gas per year ,according to C. W. Siebel, supervising engineer. The plant is operated under the direction of the U. S. Bureau of Mines and its product is used chiefly for inflating lighter than air craft for the Army and Navy. With the completion of the new dirigible, the "Macon", the total possible helium requirements of the government will be approximately 20,000,000 cubic feet per year.

Unearth Wooden Mains Laid 70 Years Ago in Ottawa, Ill.

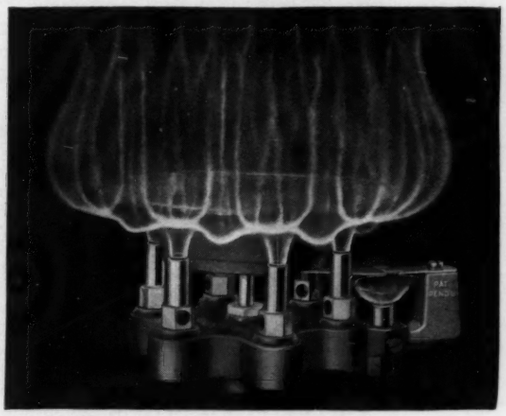
Wooden gas mains laid 70 years ago were unearthed at Ottawa, Ill., when workmen constructing a pipe line to Ottawa from the main line of the Natural Gas Pipeline Co. of America were trenching for the lateral. Walls of the wooden pipe were reported to be about two inches thick, with bell and spigot joints. The main was tapped for service by boring a hole in it and inserting a threaded iron nipple. The first gas plant was established in Ottawa in 1855. Public Service Co. of Northern Illinois serves the town.

Galveston Board to Survey and Value Texas Cities' Property

A survey of the Galveston properties of the Texas Cities Gas Co. was ordered by the Galveston board of city commissioners recently when Mayor Jack E. Pearce was authorized to advertise for bids for the employment of expert engineers to undertake this work.

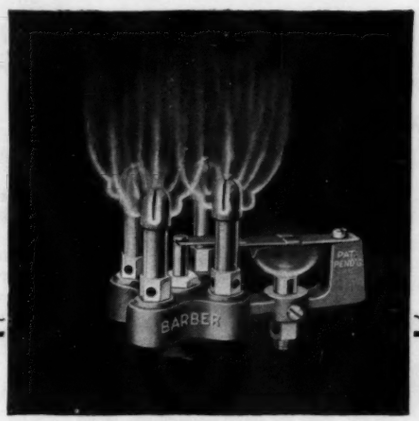
20,000,000 c.f. Well in Buttonwillow

Milham Exploration Co. on June 4 brought in a 20,000,000 cubic-foot well in the Buttonwillow field, 15 miles southwest of Wasco, Calif. This is the fourteenth large producer owned by the company in that district.



SAFETY
NOISELESS
ECONOMICAL
SCIENTIFIC CONSTRUCTION
1900° FLAME TEMPERATURE
NO BACK-FIRE
NO CARBON DEPOSIT
NEW PROFITS
NON-SERVICING

BARBER SLOTTED CAP AND BELL BAFFLE BURNERS



THERE are groups of Dealers in every industry who make money in spite of times. They are in your town, in our town, in every town. You hear constantly, "Smith up the street is making money," or "Jones around the corner had a whale of a volume of business last month."

It isn't that they have had a sensational streak of luck. They merely had the business foresight to be handling lines that were in most demand. Either due to demonstrations, quality, price, appearance, or for any of a number of reasons, their lines are moving.

In your industry the opportunity to be that Smith or Jones who is doing a profitable business, is presented by the Barber Slotted Cap and Bell Baffle Burners with Safety Control.

Designed to establish a new standard in Safety, Economy and Efficiency in gas burner appliances, Barber Slotted Cap and Bell Baffle Burners will provide you with sales features in abundance.

The public is demanding Gas Heat, and Barber Gas Burners will back up every claim you make for them. They will be profitable to you at the time of installation and will boost your reputation by their excellent performance.

BARBER
Automatic Jet Gas
BURNERS

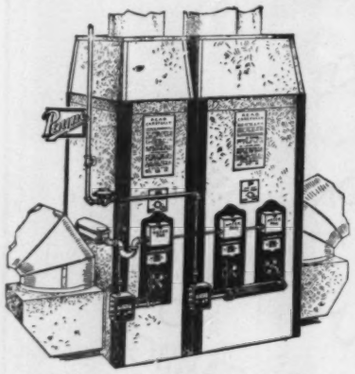
Write for the full Barber Gas Burner story and for information regarding the Barber plan of helping the Dealer sell.

THE BARBER GAS BURNER CO., 3702 SUPERIOR AVE., CLEVELAND, OHIO

Los Angeles Office—1817 Middleton Place

San Francisco—111 Balboa St.

PLANS



Plans for increased load this winter must be laid

NOW

For all round consumer satisfaction nothing excels

PAYNE GAS FURNACES

No High Bill complaints.
No sweating windows.
No expensive service.

Standardize on PAYNE Products

Payne Furnace & Supply Co.
Since 1914
Beverly Hills, Calif.

Automatic Refrigerator Distributors Formed June 13 in Dallas

Sam Grasinger, sales supervisor for the Dallas Gas Co., has been elected vice-president of the Dallas Association of Automatic Refrigeration Distributors which was organized June 13. The Dallas unit of the national organization will have as its aims promotion of an automatic refrigeration show, the encouragement of more interest in automatic refrigeration, a census of refrigerators, peak load periods, and methods of how dealer and distributor may better serve the public.

Albuquerque Federal Building to be Heated With "Natural"

The new federal office building at Albuquerque, N. M., will be heated with natural gas. A coal heating system was installed and will be changed over to gas by crews of the Albuquerque Natural Gas Co. J. C. Elliott, engineer for the treasury department, is in charge of the building construction.

Ask Permission to Construct Line to Red Oak and Shenandoah

Application was filed recently with the Iowa Railroad Commission for permission to construct and operate a natural gas transmission line from the main line of the Natural Gas Pipe Line Co. of America, to Red Oak and Shenandoah, Iowa. Iowa-Nebraska Light and Power Co., Lincoln, Neb., is the applicant. Shenandoah is now served with butane by the company.

Bulletin Describing "Fre-Flow" Fisher Strainers is Off the Press

Bulletin No. 23, covering the line of "Fre-Flow" Fisher Type 260 strainers, is announced by Fisher Governor Co., Marshalltown, Iowa.

The Fisher Type 260 strainer is designed to remove all dirt, scale or other foreign material. It is designed with a large free area through the renewable screen, offering little resistance and is planned for use on pipe lines carrying gas, water, air, oil or steam.

Outstanding features of this strainer are the large screen area, handling pipe capacities of either steam, air, water, oil, gas, or any other fluid with a small pressure drop. The bodies are furnished of either nickel, semi-steel or bronze construction, in sizes ¼-inch to 2-inch inclusive. The strainers are furnished with a perforated bronze electric weld lap-seam noncollapsible screen and the unit is self cleaning through the blow-off connection.

Copies of the bulletin, No. 23, may be obtained by addressing the company.

Report By University of Texas Contains Facts on States Gas Supply

The volume of proven reserves of natural gas in Texas is estimated at 4,000 million cubic feet, extending over 300,000 acres, according to a report being compiled by Elmer H. Johnson, industrial geographer at the University of Texas Bureau of Business Research.

Natural gas piped annually from Panhandle field to Chicago is equivalent in energy to 2,000,000 tons of bituminous coal. In 1931, Texas furnished more than 25 per cent of all the natural gas produced in the country.

SOUTH CHESTER STEEL PIPE

Excels for Gas Service

The unusual care given to accuracy of diameter and welding qualities, makes Chester Pipe a favorite for gas lines.

SOUTH CHESTER TUBE CO.
Chester, Pa.

BITUMASTIC
REG. U.S. PAT. OFF.
ENAMEL

UNDERGROUND
"Proven Protection for Pipe Lines"
UNDERWATER

Wailes Dove-Hermiston Corporation
17 Battery Place, New York
Philadelphia—401 N. Broad Street
San Francisco—345 Vermont Street
Cleveland—Union Trust Building
Los Angeles—2461 E. 8th Street
Chicago—20 N. Wacker Drive
Tulsa—Philtower Bldg.

American Smelting and Refining Completes East Helena Change-Over

The American Smelting and Refining Co., East Helena, Mont., has completed changing over its equipment to use natural gas instead of coal and oil. The plant will use the new fuel in all of its metallurgical operations, as well as for heating, according to J. D. MacKenzie, manager of the East Helena plant of the company. The smelter is now treating about 300 tons of ore daily, and has a crew of 200 men employed.

Lanyon to Represent Denver Fire Clay Co. in San Francisco

The Denver Fire Clay Co., Denver, Colo., has appointed S. Herbert Lanyon of San Francisco as representative for the sale of industrial gas burners in Northern California. The company manufactures a line of fire clay, fire brick, furnaces, chemists supplies and other equipment.

York Named Manager at Smithville

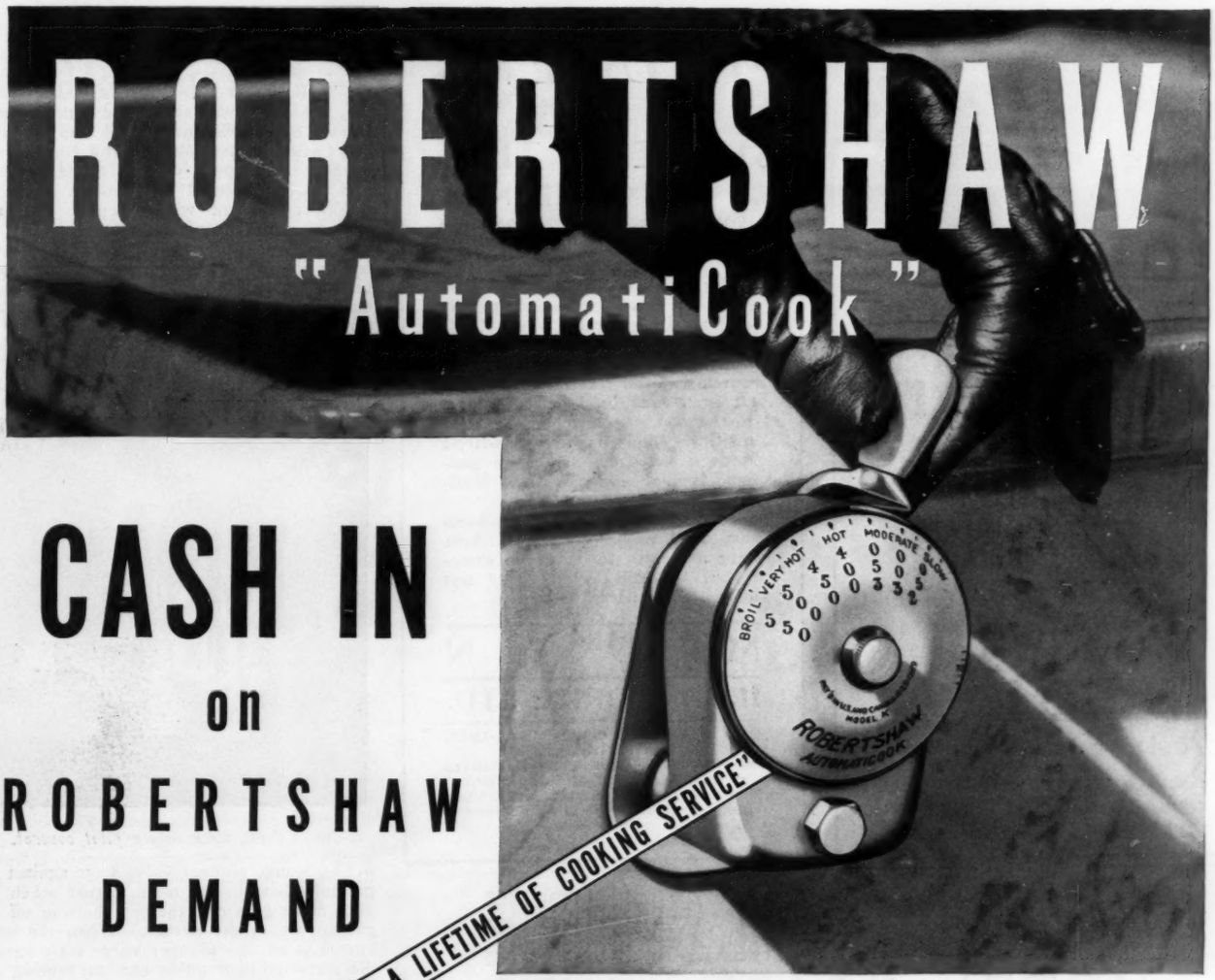
H. T. York, former salesman of the United Gas Public Service Co. has been promoted to the post of local manager for the company at Smithville, Texas. He succeeds Homer Hansen, resigned.

Eagle Grove in Line for Service

Construction is under way on a short lateral to supply natural gas at Eagle Grove, Iowa, from the Northern Gas and Pipe Line Co.'s carrier. S. S. Bragdon is manager for Iowa Public Service Co. at Eagle Grove, which company serves the town.

ROBERTSHAW

"AutomatiCook"



CASH IN on ROBERTSHAW DEMAND

"THIS CONTROL ASSURES A LIFETIME OF COOKING SERVICE"

MODEL "K"
FOR CONSOLE RANGES

The Robertshaw, both directly and indirectly, has helped you sell more gas ranges every year during the past ten years.

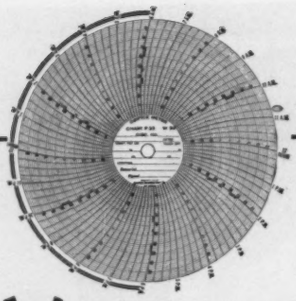
For it is the Robertshaw, and the Robertshaw advertising campaign, that starts women thinking about a new range.

This year, when you need all the sales assistance you can get, why not cash in on the Robertshaw campaign to the very limit?

Just drop us a letter and we will tell you how to do it!

MODEL "F"
FOR TABLE TOP AND CONSOLE RANGES

ROBERTSHAW THERMOSTAT CO.
YOUNGWOOD, PA.



Wet or Dry

ARCCO ORIFICE METER CHARTS ARE ACCURATE AND DEPENDABLE IN ALL KINDS OF WEATHER

•

Send for Samples

AMERICAN Recording Chart Co.
428 Boyd Street • MUtual 9183
LOS ANGELES CALIFORNIA

MADSENS MEET THE SUPREME TEST IN THE NEW SANTA FE HOSPITAL

In planning the new utility unit of the Santa Fe Hospital, in Los Angeles, Superintendent Dale Smith and Engineer Binkley insisted that every item of equipment be the absolute last word. Trained, technical eyes examined critically, and the ranges selected for the new hospital kitchens are gas-fired Madsen Cuisines . . . the gas-fired broiler and oven is a Madsen.

In equipping your kitchens you need not experiment. You have a wealth of valuable experience to guide you. Why not let us place it before you?

MADSEN IRON WORKS, LTD.

P. O. Box 601, Huntington Park, Calif.
(Suburb of Los Angeles)
San Francisco Factory Representative:
Fred R. Sanford, 837 Howard St.
Madsen Hotel and Restaurant Kitchen Equipment Sold by Leading Equipment Dealers.

The PARK WILSHIRE HOTEL APARTMENTS

Most desirably situated on Wilshire Boulevard, adjoining beautiful Westlake Park---15 minutes from the city center. By bus directly in front of the building and by three car lines within one block.

•

Apartments from $75 a Month
Also Daily and Weekly Rates

•

2424 Wilshire Blvd., at Westlake Park

•

Modern, Home-like and Supremely Comfortable

LOS ANGELES

New Line of Barber Jet Burners Placed on Market

THE Barber Gas Burner Co., Cleveland, Ohio, recently announced a new line of Barber Bell Baffle and Slotted Cap jet burners, with safety pilot control. The new burner is designed especially for domestic and small industrial installations.

The component working parts are machined and are interchangeable. The bi-metal valve opening and closing element is equipped with a shield made of high temperature corrosion resisting metal, the shield maintaining the correct operating temperature on the bi-metal. It also protects the bi-metal from the direct flame of the pilot and prevents carbon deposits should the gas contain sulphur or other impurities.

No. CP-40, with safety pilot control.

The bronze plunger valve seats against the gas inlet seat in the main burner when the pilot flame goes out, thereby shutting off the gas supply to the burner. When the main burner is on, the plunger valve seats against the metal plunger guide cap, preventing gas leakage between the plunger and guide cap. The design of this valve operation allows movement between plunger and cap.

The metal used in the Bell Baffle is of heat resisting alloy that will not warp, oxidize, scale, pit, or burn out.

The pilot jet is made from ½-inch special alloy brass with ⅛-inch male pipe thread to accommodate standard tubing connections, and is placed to apply sufficient heat to the bi-metal shield and also to ignite the main burner jets.

The Barber Slotted Jets and the Bell Baffle burner jets are made of ½-inch special alloy brass and are screwed into the automobile cylinder iron manifold to machine-faced bosses to guard against flame irregularities. These jets are engineered with the correct ratio between orifice, airport, tube and other elements to obtain efficiency in performance with manufactured, natural and mixed gases.

The new burners are especially adaptable for use on hot water heaters, space heaters, circulating heaters, coffee urns, floor furnaces, sterilizers, and many other domestic and commercial appliances.

Line Construction and Change-Over Scheduled at Mendota

Illinois Northern Utilities Co., Dixon, Ill., expects to receive permission shortly from the Illinois Commerce Commission to change its Mendota system to natural gas. A four-mile line will be constructed to serve the town, and other communities along the route of the lateral are beginning to make plans for receiving natural also.

Classified Advertising

Classified advertising five cents per word; minimum $2.00 per insertion. Situation Wanted advertisements up to 50 words will be published three consecutive issues without charge. Small professional cards 1-in. deep by 21 ems wide are $5.00 monthly on 12-time contract.

SITUATIONS WANTED—MALE

University Graduate, age 37, with 15 years utility experience in gas distribution and transmission, steam, diesel and hydro power plant design, detail and supervision, desires position. Applicant has had responsible engineering charge developing diversified utilities. Can offer excellent references as to ability and character. Address Box E-201, *Western Gas,* 124 West Fourth Street, Los Angeles, California.

Auditor and accountant, thoroughly experienced in all phases of public utility and other accounting operations. gas and oil included, desires position. Will locate anywhere. Very moderate salary. Available immediately. Unquestionable references furnished from large national concerns. Address Box E-203, *Western Gas,* 124 West Fourth Street, Los Angeles, Calif.

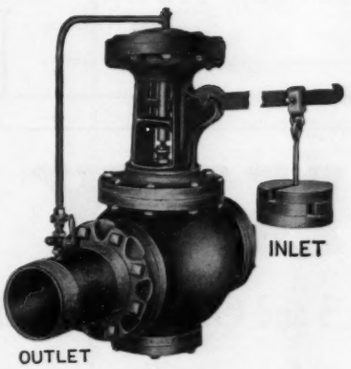
Executive seeks position as manager of gas property. Experience covers 20 years of both manufactured and natural gas. Can build industrial and house heating load and can handle merchandising and public relations work. Excellent references. Available immediately. Salary desired $3,000. Address Box E-205, *Western Gas,* 124 West Fourth Street, Los Angeles, Calif.

Gas appliance and warm air heating engineer now employed in the East wants to locate in the Pacific Coast or Rocky Mountain region. Experienced in design of gas heating appliances and in designing warm air heating and residential air conditioning systems. Applicant is college graduate, age 32 years. Address Box E-207, *Western Gas,* 124 West Fourth Street, Los Angeles, Calif.

Engineer or office manager, married man, age 31, college training, 10 years with one utility construction company as chief clerk, party chief, draftsman on electric and gas transmission, distribution and operation, hydro, steam and substation work, desires position. Applicant is open to any offer, clerk, dispatcher, transitman, temporary or permanent location anywhere. Excellent record. Address Box E-209, *Western Gas,* 124 West Fourth Street, Los Angeles, Calif.

Single man, age 29, experienced in house heating, commercial building and industrial conversion work, desires position. Applicant is familiar with all types of heating systems

..for high pressure gas transmission



Two thousand pounds pressure to the square inch can be controlled, and gas can be passed on to the main or the distributing line at reduced pressure to suit requirements, by the use of the proper C-F Regulator. Standard Regulators are designed for pressures up to 600 pounds. For higher pressures, designs are adapted according to specification.

C-F High-Pressure Regulators are in the reducing stations of practically every gas company supplying natural gas to important cities, east or west. For high or low pressures, C-F apparatus has commanded the confidence of gas engineers from the beginning of the industry. Correspondence is invited. Catalogs are mailed on request.

CF

The Chaplin-Fulton Mfg. Company

Organized 1884—Oldest Builders of Gas Regulators in the Country. Built in all Sizes from 1 inch to 24 inches; For all Service, 1 oz. up to 2,000 lbs. Pressure to Square Inch.

28-40 Penn Avenue **Pittsburgh, Pa.**

REPRESENTATIVES

WESTCOTT & GREIS, Inc.
Sales and Service
Dallas — Tulsa

JNO. W. CRAWFORD
Sales Engineer
1855 industrial Street, Los Angeles

PARSONS ENGINEERING CO.
Los Angeles, Calif. San Francisco, Calif.

Or Any Jobber

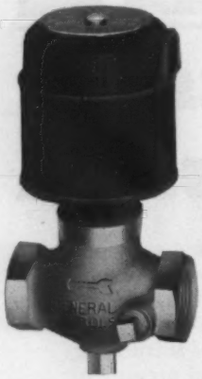
The Goodman Stopper

The Reliable Shut-off for Street Mains

Equipped with Improved Patented Locking Sleeve, which locks both handles to the pipe. Stopper cannot slip. Gas cannot pass.

Safety Gas Main Stopper Co.
523 Atlantic Avenue, Brooklyn, N. Y.

Pac. Coast Rep.: C. B. Babcock Co.
135 Bluxome Street
San Francisco, California



QUIET

General Magnetic Gas Valve Features:

Electric Hum Eliminated.
1/2-3" sizes. Low and High Voltage.
Built for High Pressure Gas.
Made in slow-opening types.
Simple in Design—Infallible in Operation—Low in Price.

GENERAL CONTROLS CO., LTD.
1539 Folsom St. San Francisco
Jensen Instrument Company Los Angeles Distributors

FORNEY

COMBINATION GAS and OIL BURNERS

For Power Plant and Industrial Uses

Write for Literature and List of Installations

FORNEY COMBUSTION ENGINEERING CO.
513 CENTRAL BANK BUILDING, DALLAS, TEXAS

CAST iron is the one ferrous metal for water and gas mains and for sewer construction that will not disintegrate from rust. This characteristic makes cast iron pipe the most practicable for underground mains since rust will not destroy it. For further information write to The Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, 309 Peoples Gas Bldg., Chicago, Ill.

CAST IRON
Registered Trademark

Build up real
PROFITS
with
JOHNSON
GAS BURNERS
for
Home Heating

Johnson Gas Appliance Co.
Cedar Rapids, Iowa
Pacific Coast Representative—C. B. BABCOCK CO.
135 Bluxome St., San Francisco, Calif.

and boilers. Experience includes surveying, figuring heat loss, annual gas consumption, boiler load demands, specifying equipment and supervising installations. Now employed as industrial sales engineer. Will go anywhere. Address Box E-211, *Western Gas,* 124 West Fourth Street, Los Angeles, Calif.

Distribution and operation natural gas man, age 28, married, desires position. Eight years experience in installing and operating town plants. Can build industrial and house heating loads and handle public relations. Have had responsible position as district manager. Moderate salary. Excellent references. Address Box E-213, *Western Gas,* 124 West Fourth Street, Los Angeles, Calif.

Gas Service Co. Employees Sell 5,417 Shares in May Campaign

A total of 5,417 5/6 shares of stock were sold in the customer-ownership campaign Kansas City, Mo. The Joplin division of the company finished first with 163 per cent of its selling quota; Wichita Division came in second with 153 per cent of its quota; and Kansas City Gas Co. was third, with 125 per cent of its quota. N. W. Carpenter, manager of the Union Public Service Co., Chelsea, Okla., which comes under the Joplin Division, sold 3,110 per cent of his company's quota.

Line to Get Under Way to Serve Magee Sanitorium in Mississippi

Contract for supplying gas service to the Magee Sanitorium, one of the largest in Mississippi, has been awarded to the Public Service Corp. of Mississippi, supply to come from the company's main line from the Jackson field to Hattiesburg. It will be necessary to construct a short lateral from the line to the sanitorium.

S. and S. Engineering Co. to Represent Denver Fire Clay Co. in Chicago

The Denver Fire Clay Co., Denver, Colo., had appointed the S. and S. Engineering Co., 2417 North Ashland Blvd., Chicago, as distributor of the company's gas burners in Chicago and parts of Illinois, Indiana and Wisconsin.

Borden Co. Changes Price Scale West of the Rockies

Beginning April 15, the Borden Co., Warren, Ohio, announced that net prices on Beaver tools would be the same throughout the entire United States. Formerly, prices were 5 per cent higher west of the Rockies.

Conroe, Texas, to Be Served By Moran Gas Corp. of Texas Shortly

The Moran Gas Corp. of Texas is piping gas to Conroe, Texas, from the Montgomery county field and is building a distribution system there.

Creston, Iowa, To Have Natural

Central States Electric Co., Cedar Rapids, Iowa, has applied to the Iowa Railroad Commission for permission to construct and operate a gas transmission line from the main line of the Natural Gas Pipe Line Co. of America to Creston, Iowa.

SPRAGUE SEMI-CHROME LEATHER

Resists acids
and boiling water.

Now Used in All

SPRAGUE METERS AND REGULATORS

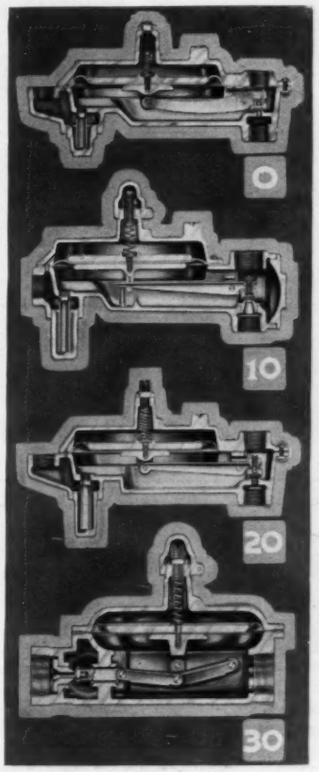
May we send you
samples and data?

The Sprague Meter Co.

BRIDGEPORT, CONN.
Los Angeles, Calif., San Francisco, Calif.
Newark, Ohio
Davenport, Iowa Houston, Texas

Memo: O. K. READY FOR SHIPMENT . . . FOUR SERVICE MODELS: 0 · 10 · 20 · 30 *f. h.*

The above is just a curt statement from one department to another, but behind it is an interesting story. For more than 40 years just such statements have been coming through the Reynolds Factory in a continuous stream which means hundreds of thousands of Regulators shipped all over the world. Also it is known that they are still giving satisfactory service day in and day out. Of course this is no news to Reynolds, but to you it is offered as conclusive proof that the performance of Reynolds Regulators is based upon tangible facts. Every Reynolds Regulator must pass rigid tests for the following: accurate delivery, maximum capacity and positive control. This is just a factory guarantee. The record these Regulators have made "on on the job" is the real guarantee of a good product and is assurance that the cost is thrifty.



●

MODEL 30 Features toggle type lever control. Made for any service requirement. Built in either Horizontal or Vertical Connections.

Reynolds Branch Offices:
422 Dwight Building
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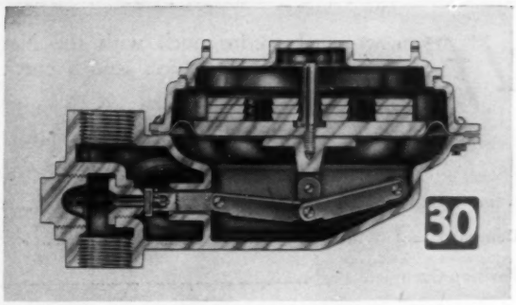

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American Gas Products Corporation —
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American Meter Company 12
American Recording Chart Co. 60

The Barber Gas Burner Co. 57
H. R. Basford Company 56
A. M. Byers Company 2
Byron Jackson Co. Second Cover

J. A. Campbell Company 52
The Cast Iron Iron Pipe Research Ass'n. 62
The Chaplin-Fulton Mfg. Co. 61

Dayton Pipe Coupling Co. 9
Dearborn Chemical Co. 54
Detroit-Michigan Stove Company —
S. R. Dresser Manufacturing Co. 5

Electrolux Refrigerator Sales, Inc. 49
The Fisher Governor Co. 4
The Fluor Corporation, Ltd. 1
Forney Combustion Engineering Co. 62
Fraser Furnace Company, Inc. 56

Gas & Electric Facilities, Ltd. 54
General Ceramics, Ltd. 54
General Controls Co., Ltd. 62
General Paint Corporation 7
Groble Gas Regulator Company 41

The Hoffman Heater Co. 56

Johnson Gas Appliance Co. 62

Kerotest Company 41

Linde Air Products Company —

Madsen Iron Works 60
Milwaukee Gas Specialty Co. Front Cover
Minneapolis-Honeywell Regulator Co. —

National Transit Pump & Machine Co. —
National Tube Company 47
Natural Gas Equipment, Inc. 10

Pacific Gas & Electric Company 53
Pacific Pipe & Supply Co. —
The Park Wilshire 60
Payne Furnace & Supply Co., Inc. 58
Pittsburgh Equitable Meter Co. —

Reliance Regulator Corp. Back Cover
Republic Steel Corp. 8
Reynolds Gas Regulator Company 63
Roberts-Gordon Appliance Corp. 54
Robertshaw Thermostat Company 59
Robinson Orifice Fitting Company —
George D. Roper Corp. —

Safety Gas Main Stopper Company 61
Semet-Solway Engineering Corp. 3
Wm. B. Scaife & Sons Co. 40
South Chester Tube Co. 58
Sprague Meter Co. 63
Standard Gas Equipment Corp. 51

The U. G. I. Contracting Co. 6
United States Pipe & Foundry Co. 56

Wailes Dove-Hermiston Corp. 58
Welsbach Co. 55
Western Gas Third Cover
William Taylor Hotel 56

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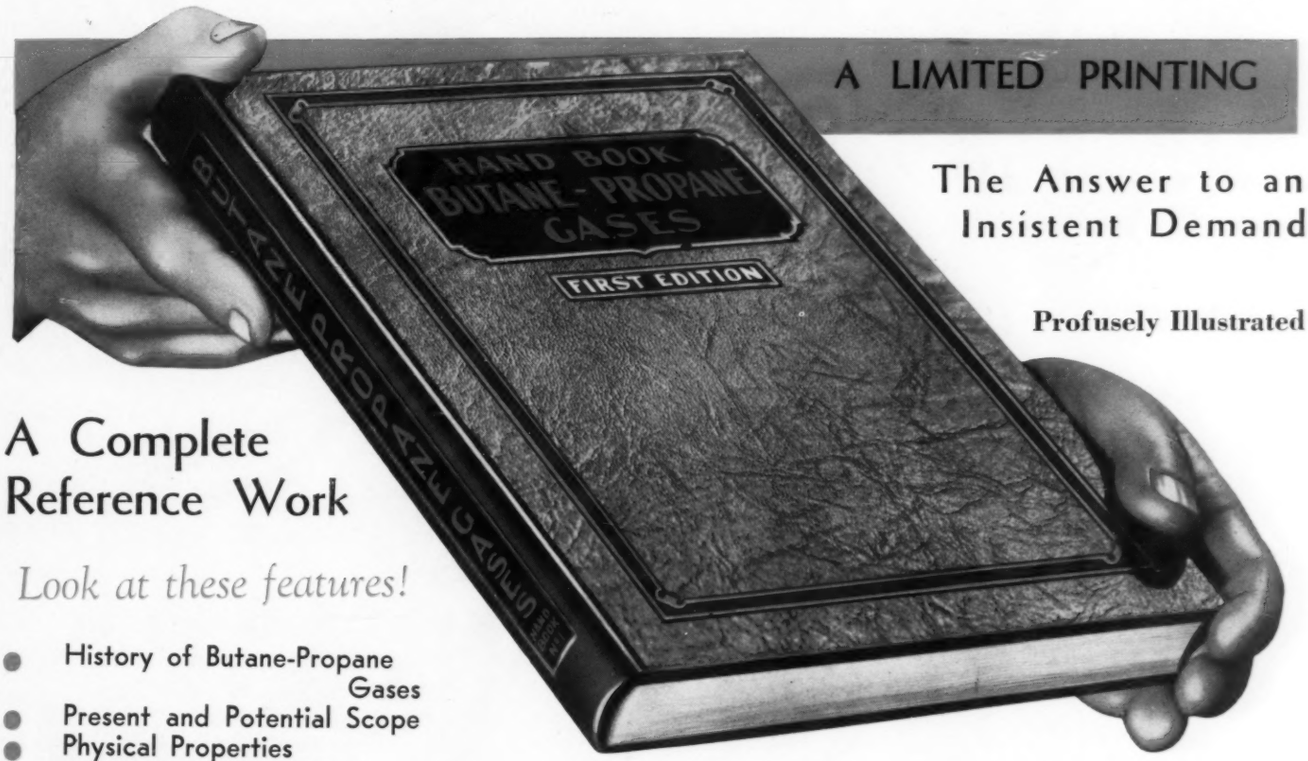

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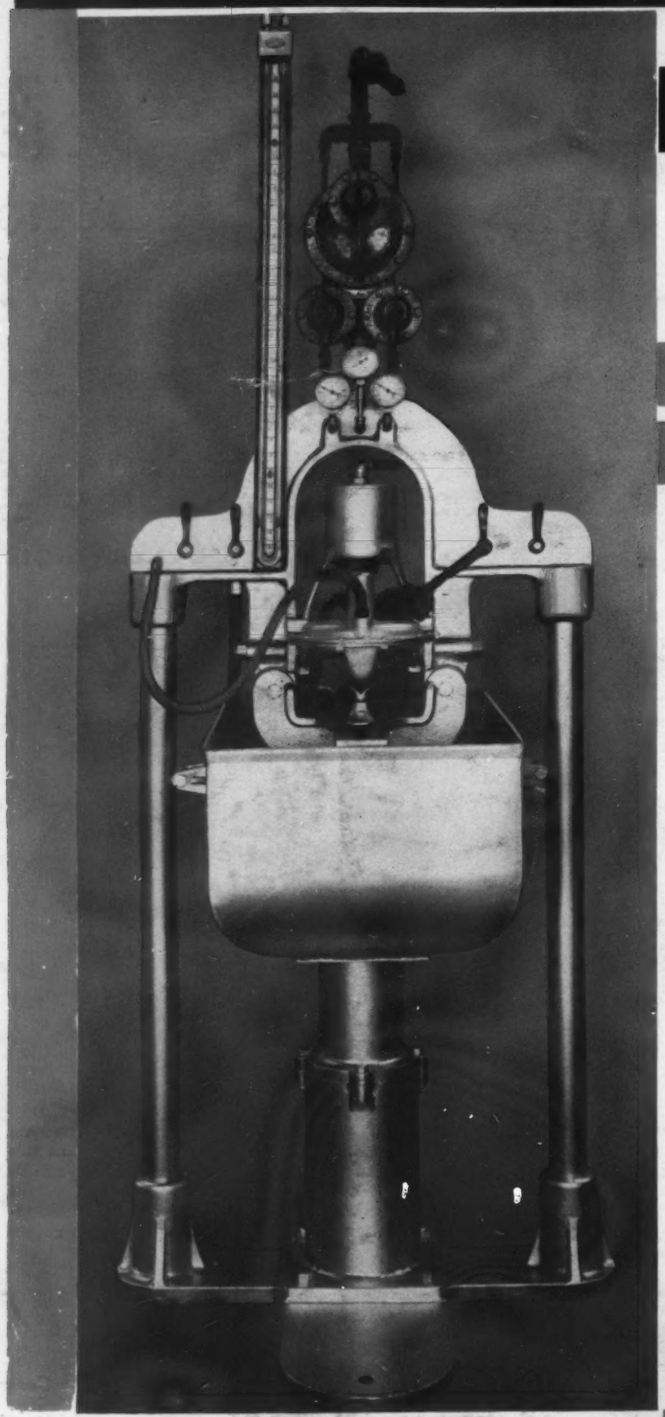

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